Ontario

ENVIRONMENTAL ASSESSMENT BOARD

VOLUME: XIX

DATE: Tuesday, June 28th, 1988

BEFORE: M.I. JEFFERY, Q.C., Chairman
E. MARTEL, Member
A. KOVEN, Member

FOR HEARING UPDATES CALL (TOLL-FREE): 1-800-387-8810

FARR & ASSOCIATES REPORTING INC.

(416) 482-3277
2300 Yonge St., Suite 709, Toronto, Canada M4P 1E4

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EA-87-02

HEARING ON THE PROPOSAL BY THE MINISTRY OF NATURAL RESOURCES FOR A CLASS ENVIRONMENTAL ASSESSMENT FOR TIMBER MANAGEMENT ON CROWN LANDS IN ONTARIO

IN THE MATTER of the Environmental Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER of the Class Environmental Assessment for Timber Management on Crown Lands in Ontario;

- and -

IN THE MATTER of an Order-in-Council (O.C. 2449/87) authorizing the Environmental Assessment Board to administer a funding program, in connection with the environmental assessment hearing with respect to the Timber Management Class Environmental Assessment, and to distribute funds to qualified participants.

Hearing held at the Ramada Prince Arthur Hotel, 17 North Cumberland St., Thunder Bay, Ontario, on Tuesday, June 28th, 1988, commencing at 8:30 a.m.

VOLUME XIX

BEFORE:

MR. MICHAEL I. JEFFERY, Q.C.	Chairman
MR. ELIE MARTEL	Member
MRS. ANNE KOVEN	Member

A P P E A R A N C E S

MR. V. FREIDIN) MS. C. BLASTORAH) MS. K. MURPHY)	MINISTRY OF NATURAL RESOURCES
MR. B. CAMPBELL) MS. J. SEABORN)	MINISTRY OF ENVIRONMENT
MR. R. TUER) MR. R. COSMAN) MS. E. CRONK) MR. P.R. CASSIDY)	ONTARIO FOREST INDUSTRY ASSOCIATION and ONTARIO LUMBER MANUFACTURING ASSOCIATION
MR. J. WILLIAMS	ONTARIO FEDERATION OF ANGLERS & HUNTERS
MR. D. HUNTER	NISHNAWBE-ASKI NATION and WINDIGO TRIBAL COUNCIL
MR. J.F. CASTRILLI) MS. M. SWENARCHUK) MR. R. LINDGREN)	FORESTS FOR TOMORROW
MR. P. SANFORD) MS. L. NICHOLLS) MR. D. WOOD)	KIMBERLY-CLARK OF CANADA LIMITED and SPRUCE FALLS POWER & PAPER COMPANY
MR. D. MacDONALD	ONTARIO FEDERATION OF LABOUR
MR. R. COTTON	BOISE CASCADE OF CANADA LTD.
MR. Y. GERVAIS) MR. R. BARNES)	ONTARIO TRAPPERS ASSOCIATION
MR. R. EDWARDS) MR. B. McKERCHER)	NORTHERN ONTARIO TOURIST OUTFITTERS ASSOCIATION
MR. L. GREENSPOON) MS. B. LLOYD)	NORTHWATCH

APPEARANCES: (Cont'd)

MR. J. W. ERICKSON) MR. B. BABCOCK)	RED LAKE-EAR FALLS JOINT MUNICIPAL COMMITTEE
MR. D. SCOTT) MR. J.S. TAYLOR)	NORTHWESTERN ONTARIO ASSOCIATED CHAMBERS OF COMMERCE
MR. J.W. HARBELL) MR. S.M. MAKUCH)	GREAT LAKES FOREST PRODUCTS
MR. J. EBBS	ONTARIO PROFESSIONAL FORESTERS ASSOCIATION
MR. D. KING	VENTURE TOURISM ASSOCIATION OF ONTARIO
MR. D. COLBORNE	GRAND COUNCIL TREATY #3
MR. R. REILLY	ONTARIO METIS & ABORIGINAL ASSOCIATION
MR. H. GRAHAM	CANADIAN INSTITUTE OF FORESTRY (CENTRAL ONTARIO SECTION)
MR. G.J. KINLIN	DEPARTMENT OF JUSTICE
MR. S.J. STEPINAC	MINISTRY OF NORTHERN DEVELOPMENT & MINES
MR. M. COATES	ONTARIO FORESTRY ASSOCIATION
MR. P. ODORIZZI	BEARDMORE-LAKE NIPIGON WATCHDOG SOCIETY
MR. R.L. AXFORD	CANADIAN ASSOCIATION OF SINGLE INDUSTRY TOWNS
MR. M.O. EDWARDS	FORT FRANCES CHAMBER OF COMMERCE
MR. P.D. McCUTCHEON	GEORGE NIXON

APPEARANCES: (Cont'd)

MR. C. BRUNETTA	NORTHWESTERN ONTARIO TOURISM ASSOCIATION

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I N D E X O F E X H I B I T S

---Upon commencing at 8:30 a.m.

THE CHAIRMAN: Good morning, ladies and gentlemen.

Ladies and gentlemen, as you are aware, we are going to be breaking today at, I mentioned yesterday 2:15, but I think it is going to be 2:00 p.m.

This is also the day that the hotel, as you may recall from last week, requested the use of this room for a function later this afternoon and the Board had agreed that since it would be breaking early that we would clear out of the room at approximately 2:00 p.m. So we will be breaking at that hour.

I also apologize, but we are also going to have to break for about ten minutes at 9:30. I have to contact somebody in Toronto at that hour who is only available at that hour. And so we will be breaking for perhaps our mid-morning break at that time, a little bit earlier.

The last thing before we commence today is I wanted to advise all of you and place it on the record that the transcript depository which had previouly been in Thunder Bay at the Thunder Bay Public Library at the Waverly Branch has now been relocated to the Reference and Information Services Section of the Chancellor Patterson Library at the Lakehead University

at 953 Oliver Road, Thunder Bay, Ontario. And its postal code, if anyone is going to be writing them, is P7B 5V1.

If you recall, there was a request by the University that the transcripts be placed on deposit there so that the university faculty and the student body could have access to them and, since people have access to transcripts in the Board's reading room at this location, it was felt that giving them to the University would serve both purposes.

Are there any more matters of a preliminary nature before we start today?

(No response)

Very well. Mr. Freidin?

MR. FREIDIN: I assume, Mr. Chairman, are you planning to work through the lunch hour then?

THE CHAIRMAN: I think it would probably be preferable if we did. We will take the odd 20-minute break throughout the morning and early afternoon and then perhaps go until two o'clock and then we can break then for lunch and the rest of the day.

JOHN EDWARD OSBORN,
KENNETH A. ARMSON, Resumed

CONTINUED DIRECT EXAMINATION BY MR. FREIDIN:

Q. Dr. Osborn, yesterday I believe we ended -- or when we ended we were discussing paragraph 16 of the witness statement which deals with the effect of changing the choice of rotation age and you had taken the Board through paragraph -- pardon me, Documents 12(a), (b) and (c).

And perhaps before we just move on to the next document, you could just recap the message, the main points that you wish to make when you referred to the Document 12?

DR. OSBORN: A. On page 111 of the evidence-in-chief document for this panel, there is a diagram which is entitled: Choice of the Trees and the Changes in the Rotation Age or Maturity, and we had earlier explained that there was a managerial choice on the age or time horizon as to where we would decide on a rotation in the management of our forests. And in the examples presented yesterday the age of 80 had been used throughout the examples.

Just at the end of yesterday, we introduced the concept that that choice may change and that choice may change and, in this example, the choice may change because industry or the user of the resource in timber find they can use a product either at a younger age, in the case of the value here, at Y, or in

fact they require a product requiring trees that are older and/or larger as in the example at X on the diagram.

So we were briefly talking about the rotation may change because of a user requirement, and on page 112 we introduced this diagram illustrating that if we had a forest which had been grown and managed on a 80-year rotation, so we have a normal forest in this diagram showing that what the forest would look like in terms of volume up to age 80, what do we do now when we move that forest management from 80 to 60.

And on page 113 we introduced a diagram going through five potential options and alternatives. This is where we left at the end of yesterday.

Q. Dr. Osborn, the Document 13 which is found at page 114 of the witness statement, does it also deal with a situation where there has been a change in rotation?

A. Yes. On page 114 of the evidence we have a change in rotation as caused - as the title infers - by the effects of silviculture stimulating the growth, whereby the trees grow faster, such that the rotation, which in the first diagram on the left-hand side, the rotation at A, the number of years being A -

year 60, year 80, whatever - and on the second diagram on the right-hand side the original A, you can see now that the new rotation, which is B, in essence is shorter.

And this effect is caused now by the forest manager being able to do something whereby the trees can be grown to that same size, as in rotation A, can now be grown through whatever practices are done to the forest in that shorter time horizon.

So these two sets of diagrams, the previous set at the end of yesterday caused by a change in being able to utilize younger material, or changing the rotation because silviculturally we have done something to the forest, both of those two may cause a change in rotation and the options of management that were described at the end of yesterday would also be thought through with regards to this action.

Q. Dr. Osborn, in paragraph 17 you make a comment about whether or not a normal forest actually exists in Ontario, and you dealt with that in answer to a question from the Chairman yesterday.

Document No. 14 which appears at page 115 -- or starts at page 115 is entitled: The National Forest Sector Strategy for Canada, and perhaps you could advise the Board what that document is and then

indicate why you have included it as the reference under paragraph 17?

A. On page 115, the title of the document shows that it's a National Forest Sector Strategy for Canada. It was a document put out by the Canadian Council of Forest Ministers accompanied by a variety of technical staff, and so a document put out describing what -- in the forest sector, what sort of operation should we consider, what sort of conditions do we have in the forests of this country, and where should we go in terms of what we want to develop in this country.

So there is a variety of statements describing the forest, as well as a variety of recommendations as to where this country's overall forest strategy should go in the future.

Q. You say it was a Canadian Council of Forest Ministers. What exactly is that?

A. I am not sure of the exact make-up of that, not being there or not being a party to that, but I...

Q. Perhaps Mr. Armson can help us with that. Are you able to advise us what that Council did, Mr. Armson?

MR. ARMSON: A. Yes, I can, Mr. Freidin.

I have attended all the meetings of the Canadian Council of Forest Ministers. The Council was formed and had its first meeting in September of 1985, and the membership comprises the Ministers of Forestry or of Natural Resources who have responsibility for forests from all the ten provinces, as well as the ***Minister of State for Forestry & Mines, Mr. ***Merith from Ottawa. There were also representatives from the two territories, the Yukon and the Northwest Territories.

The Council was formed as a result of the forest ministers who, up until that time, had been members of the Canadian Council of Resource and Environment Ministers determining that they felt they should meet as a separate entity and they have done so and, in fact, although only obligated to have one weekly meeting, they have more than that.

I think that gives the Board...

THE CHAIRMAN: Is their participation still part of CREM?

MR. ARMSON: No, they are not part of CREM. Just a word maybe about the strategy. One of the activities that the Council found itself was to sponsor the development of a National Forest Sector Strategy, and in doing that, they not only have a document or a draft document, but they brought together

representatives from all the major user groups across the country and the meeting referred to here in St. John of last year was the final meeting at which that strategy was given approval by the Council and essentially by all of the ministers.

MR. FREIDIN: Q. Dr. Osborn, can you then advise the purpose for which you refer to this document at this particular place in the witness statement?

DR. OSBORN: A. On page 117 there are two paragraphs which I want to draw your attention that directly relate to the evidence that's been presented yesterday and at the beginning of this morning.

On page 117, in the fourth paragraph, the words read:

> "Sustained yield or sustainable development has different meanings for different people, but essentially requires the application of management to provide for a continuity of supply. Although usually related to wood supply, the principle is equally applicable to the maintenance of other resources whether they be water, wildlife, fish or recreation opportunities."

And the following paragraph is also applicable very much to the evidence of yesterday:

> "Sustainable development carries with it an implicit obligation for management including forest renewal. Management activities require defined objectives in concrete and measurable terms. Clear objectives are the responsibility of the landowner, the public in the case of Crown lands. Also the forest may not be in a condition it terms of species, age, location and distribution to provide the benefits desired immediately without considerable manipulation over time."

Now, those two paragraphs by this Council of Ministers essentially echoed much of what was presented yesterday in terms of structure, age-class distribution, management objectives, how do we take what we have today and move it towards tomorrow.

On page 118, near the top of the page, is the title: Wood Supply and Other Benefits, and the second paragraph of that particular section reads:

> "The age-class structure of Canadian forest never was and is not now balanced to meet our needs over time. For

example, in some regions the "old forest" on which the forestry industry depends for raw material and which provides habitat necessary for some animals is in overabundant supply. The younger age-classes are generally adequate for sustainable development or can be made so by intensive silviculture or habitat treatment. But the middle age-classes are in short supply. Given a clear set of objectives and the determination to undertake the management activities necessary to meet these objectives, the "old forest" can, through allocation, protection, and access, be regulated to last longer and the "new forest" can, through intensive silviculture practices, be accelerated to mitigate problems of missing middle age-classes. These problems of harvest, protection and intensive silviculture, along with access, will be necessary to provide raw materials for industry and the diversity of habitat for wildlife and recreation." Again, that paragraph tends to exemplify

much of that which was said yesterday. That was the rationale for citing these two parts of this document.

Q. Now, Dr. Osborn, when you read the last sentence, would you agree that it reads: "These processes of harvest, protection..." et cetera?

I believe the record will indicate that you read there that "these problems of harvest..." We agree that it should be these processes of harvest, protection, et cetera?

A. Yes, sir.

Q. Dr. Osborn, if I can just take you back to page 117, in the first sentence that you quoted, there is reference to the phrase continuity of supply. And throughout some of my questioning I have used the phrase sustained supply.

Is that different than sustained yield in the way you use those two phrases?

A. No, the expression sustained yield, if you like, is a forestry jargon for what might be sustained supply or for what this document in lay terms describes, continuity of supply. The English expressions are equivalent.

Q. Could you then, Dr. Osborn, now that we have gone through this area of sustained yield and we have looked at the two definitions that you referred

to, I believe on page 19 of the witness statement, and could you advise the Board what the term sustained yield does mean then in Ontario?

A. As was just stated, we are concerned with continuity of supply. The undertaking was continuous/predictable supply. All of those expressions indicate a need to supply today to the existing forest industry a supply, to provide that to them and, in addition, to ensure that the forest can continue to provide a supply to forest industry.

So there is a twofold part of the objective, twofold part of that which in practice is sustained yield and that's having the wood there today and doing things today to the forest such that we try and ensure the wood is there for tomorrow.

In paragraph 18 on page 23 in the witness statement, there are words that started off with explaining that we would endeavour to explain sustained yield in a practical sense. We spent much of yesterday going through the thinking and the theory, now what does that really mean in Ontario, what does the practicing forester pick up and run with, what does he in fact -- he or she do.

Document 15 starting on page 124 presents a series of diagrams that try to illustrate what was

behind the words written in paragraph 18.

Q. Mr. Chairman, before Dr. Osborn reviews those particular tables or documents with the Board, am I correct, Dr. Osborn, that there were questions asked during the interrogatory process, by more than one party, asking for an explanation of the particular documents which make up Document 15?

A. There were.

Q. And I understand that an answer was prepared by you and, in fact, given to the parties asking those questions clarifying the purpose of those documents?

A. That is correct.

MR. FREIDIN: Mr. Chairman, Dr. Osborn has indicated to me that he believes it would be useful to go through the explanation orally, however, he has indicated that he took some pain to explain these particular documents in writing and if there is no objection from my friends or from the Board, I would like to file the question which was asked by Venture Tourism Association of Ontario - very similar to a question which was asked by the Ministry of the Environment as well - and the written response, but still have Dr. Osborn provide the necessary clarification in oral testimony.

So if there is no objection to following that procedure, I think it would be helpful to have it...

THE CHAIRMAN: Well, do you intend to lead him through the question and answer line-by-line orally?

MR. FREIDIN: No, no. I am going to allow him to explain the document in his own words. It may very well be that he will provide all the information that is in this document and then some perhaps but it was just that, as I indicated, Dr. Osborn - we spoke about this - asked whether it was proper that I should just file it, and he feels it is important and a series of documents that he would like to speak to.

THE CHAIRMAN: Very well. Let's admit the two documents together. Perhaps the question can go in as Exhibit 81 and the answer can go in as Exhibit 81A.

Oh, I see. The question is repeated on this one sheet; is that right?

MR. FREIDIN: Yes, sir.

THE CHAIRMAN: All right. So then let's just call it Exhibit 81 which will contain both the question and the answer.

MS. SEABORN: Perhaps, Mr. Chairman, we could identify the question and answer number for the record for each of these interrogatories.

THE CHAIRMAN: Sorry, what did you have in mind?

MS. SEABORN: Well, just that the Venture Tourism Association question is Question No. 16 and then I believe the answer would be 16.

THE CHAIRMAN: Oh, I see of their interrogatory.

MS. SEABORN: Yes, their interrogatory.

THE CHAIRMAN: Very well.

MR. FREIDIN: So the question which was asked --

THE CHAIRMAN: Sorry, what group again was this that put it in?

MR. FREIDIN: It is indicated at the top of the document, Venture Tourism.

THE CHAIRMAN: Oh, Venture Tourism Association of Ontario.

---EXHIBIT NO. 81: Interrogatory Question No. 16 submitted by Venture Tourism Association of Ontario

MR. FREIDIN: Q. And the question which was asked was: In examining the graphs in this document it appears that as a result of current

practices where depletion exceeds growth there will be a shortfall of wood supply between 1995 and 2030.

It is recognized that although these graphs are hypothetical, they may have some basis as examples of what may be expected to happen. Please provide more details on the wood supply that can reasonably be expected to be available during this period?

DR. OSBORN: A. The question in the way it was posed indicated - this is really why I wanted to explain this - that there was a misunderstanding, a misconception as to what was being portrayed here, which is a hypothetical example of how a practice is conducted not an actual set of numbers to portray what we may think about tomorrow. That latter part in fact will be part of Panel 4.

The three sets of diagrams, the first one commencing on page 124, were to try and portray, as the title infers, the purpose of the undertaking and how did we practically interpret that under this idea of sustained yield, again, reminding you that sustained yield was the wood supply for today and the wood supply for tomorrow. It is two facets.

The diagram on page 124 is presented in a format that I started yesterday morning with. We have

a concern about volume and we have a concern over time. The initial diagrams in yesterday morning had a fuction of growing stock which is somewhere over -- above the ceiling in terms of scale. I am going to deal in these diagrams primarily concentrating on the marrying of what happens to depletion and what happens to growth.

And, again, we are coming back to and going over similar material to that which was presented in the first piece of documentation yesterday morning.

This particular set of diagrams will start with a simulation where today, in this first diagram, we will hypothesize is 1990, we will transport ourselves through time and now it is 1990 in the case of this particular diagram. We are going to simulate walking through time in this set of diagrams.

So in 1990 we will have some knowledge of what has happened in the past in forms of depletion, we will have some knowledge in what has happened to the growth of the forest. Today, 1990, we will make some estimate as to where the depletion may go over time. For the first five-year period we have perhaps a greater understanding, a greater degree of probability that we know what the depletions may look like from 1990 to 1995, and we will estimate where we think they may extend to over time.

And as was mentioned yesterday, the length of the time horizon will continue out, although they are not shown on this diagram, for a rotation and the further it goes, the less the probability of success of actually achieving or finding.

So as of now, 1990, we will make an estimate of what will happen in terms of depletion.

Similarly, as of today, we will make an estimate as to what the growth rate of the forest will be for the first five years, a very good indication and ensuing future. Remember, what we are trying to get is: Let's make sure that we can supply - because part of depletion is the cutting - we can supply industry today and continue to do so tomorrow.

The fact that depletion at this point in time exceeds growth, we pay attention to it, but it is not a situation whereby we say you can only cut the grass. Today we supply industry, we make a projection to see whether in fact that can be sustained by looking at these two kinds of lines, depletion and growth. We do that today, 1990.

Page 125, the second diagram in the series, same title, purpose of the undertaking and how practically we are providing sustained yield. The diagram on page 125 now tells us that today, as shown

on the diagram is 1995, simulated we have moved through time, it is now 1995. What does this mean in terms of the practises of sustained yield? What does this mean in terms of the management objectives; short-term, long-term?

We have got records from 1990, which is what the last diagram was, to 1995 and in fact the depletions which were projected in 1990 as a nice straight line, you may recall, didn't happen the way we anticipated. In fact, in the depletions in actuality, as shown on this diagram in about 1992, as shown on the diagram, there was a distinct drop in the depletions.

Now, today, on this diagram is 1995, so looking back we find that what we thought would happen didn't actually happen, for some reason the depletions were less than predicted. A whole variety of circumstances may have caused that, there may have been, as there has been, for example in the 70s, a strike in forest industry whereby all of a sudden the level of cutting went down.

The number of circumstances that caused would have been documented and the manager sees what he thought was going to happen hasn't actually happened that way and the reasons would be determined as best they could be. Some of them may be more complex as to

why that has happened.

The growth rate, also from 1990 to 1995, was projected as a straight line but that hasn't actually happened either. Around 1993 there was a profound leveling off to a horizontal line in the growth rate.

So today, which is now 1995 in this diagram, we have looked backwards and see what actually happens in comparison with what we thought -- projected would happen. Conceptually no different from management in any undertaking.

In 1995, today, we look at what we have and, again, we will make a forward estimate of where is the projection for the depletions. Again, for the first five-year period 1995 - that is today until the year 2000 - we have a fairly good estimate, we think, of what those depletions may be and we will project that further into the future, again, with less and less probability.

Similarly in 1995, today, we will make an estimate of what we think will happen to the growth of the forest. Again, for the first five years we have a greater degree of feeling, success, than beyond. We project the growth to increase and then there is a severe drop off.

So today, in 1995, we foresee, for example, spruce budworm epidemic reaching a proportion that causes the growth to have a severe drop, for example.

So the forest managers in 1995 is sitting with some information and knowledge that causes them to predict there may well be a rise and fall in that first five-year period of the growth rate, but the long-term effect is thought to be an increasing line.

So in 1995 we have looked back and compared what actually happened with what we thought would happen; in 1995, we have looked into the future and estimated where we would go, all the time making sure in the depletions what would be going into the mill and the long-term future of the forest was being considered.

We have got some form of adaptive management, we have got some form of keeping track of what we actually did, comparing what we projected and using that comparison to look forward again.

Lastly, on page 126, the last diagram in the series to illustrate the point, we are still talking of the practical application of the sustention of having wood today and wood tomorrow.

It is now the year 2000, today is the

year 2000. Again, we will look backwards and see what actually happened 1995 to the year 2000 and compare. Depletions, in fact, echo a little bit of what we thought would happen if we were to make the comparison with the previous diagram. Our estimates from 1995 to the year 2000 were very good.

However, the growth drop -- the drop in growth that was projected, 1995 to the year 2000 in the previous diagram, didn't come into effect for whatever reason. Example of the spruce budworm that was alluded to, maybe there was a very profound series of sharp-like thrusts which tends to cause the insects some distress. The growth rate was not slowed down, the growth rate in fact of the forest went better than was projected.

We try and learn by looking backwards at what actually happened to what we projected, we take that learning continously and try to re-apply as to what may happen.

We again, today, year 2000, will estimate what do we think will be the depletions. The year 2000, again, ensuring wood supply to industry and the projection of the forest. Again, we will estimate what may happen to the growth, and this particular diagram maybe is what caused some anxiety in the mind of the

questioner in the interrogatory where we appear to have an ever-dwindling growth rate and an ever-increasing depletion, was there some disaster being foretold in the diagrams?

No, this is a simulation, there was no deliberate reason to cause anxiety where these two lines of depletion and growth went. If we continue this and went through the exercise as a simulation you could imagine projecting this to diverge or converge, it is just a simulation model.

Panel 4 will start to numerically exemplify, put in some actual numbers of what this kind of diagram could show in Ontario.

The main purpose of this set of diagrams was to illustrate how the forest manager at any point in time, today, looks backwards as to what happens versus what was planned, looks forward as to what he or she may expect to happen; growth, depletion, trying to keep those two aware of each other because it is the blending of those two that is really what forest management is about, still all the time keeping track of the growing stock which is way up here in the diagram, that is still there, but it is the marrying of these two that we pay attention to because of the words in the definition of sustained yield; this marrying of

cutting and growth, recognizing the dilemas and the state of the forest.

So the diagrams try and exemplify: Today we worry about wood supply, today we worry about tomorrow's wood supply, it is a continuous recycling of comparing, relearning, replanning.

Q. Okay. In those diagrams, Dr. Osborn, you have chosen to show -- when you said that this was a theoretical example, you have chosen to show the analysis done every five years. Is that a theoretical time frame or does that time frame have some truth in reality?

A. Today, the practice is the five-year time horizon is in the planning process. As a historical note, 20 years has been the traditional planning horizon both in this province, in this country, and most of the world in forest management.

As the forest management scenario in Ontario becomes more refined, the planning horizon has changed and the need to relook, relearn, replan, reproject, we have changed that as is reflected in the diagrams shown, in bringing in the five-year look, as well as keeping cognizance of the 20-year time horizon that was presented in the first document yesterday morning.

So we still have a 20-year look, a long-term look, and a five-year look, recognizing the ability to estimate tomorrow becomes more and more difficult the longer the time horizon.

Q. And in your discussion of those three diagrams you referred in each of them to looking to the past as something which would allow you to better predict the future.

Do you know whether or not that is something which is a requirement in the timber management planning process that will be discussed by later panels?

A. Yes, it is.

Q. And, if I might, does that requirement relate to a portion of the timber management plan which is referred to as a report of past forest operations?

A. The exact title of the particular table in the manual I do not know, so I can't answer your question exactly without looking in the manual and checking which table. I don't use them on a day-to-day basis.

Q. I would like to read to you the first paragraph of Exhibit No. 7, which is the Timber Management Planning Manual, at page 29, under the

heading Report of Past Forest Operations.

I would ask you whether in fact this is a fair representation of what you believe -- what you were referring to about looking to the past.

> "The purpose of this section is to report progress and meeting management objectives and to compare planned and actual achievements. This analysis of past operations will help identify problem areas, improve future planning, and provide support for changes in the level of proposed operations."

A. Yes. This manual echoes essentially some thoughts and concepts that were applied in previous management planning manuals. This is the continuation of that five year of relearning.

Q. If we go back then to the definitions of sustained yield, which were found on page 19 of the witness statement, are you able to advise whether it is possible -- well, do either of those definitions in fact describe then what sustained yield means in Ontario?

A. Yes. And between the two of them the second, that which is given in paragraph 6, is somewhat closer to the realities in Ontario because of the area,

volume, age-class, structures that have been portrayed to you yesterday.

The definition in paragraph 5 is primarily dependent upon the theory of the actuality of having a normal forest. The words in paragraph 5 on page 19 are applicable primarily with something close to that normal forest scenario, if applied literally.

The words in paragraph 6 indicate that there could be and should be a degree of flexibility, both in the timing and the level, the amount of and the timing of that which is cut today and forecast for tomorrow. And this in essence -- the words in paragraph 6 will be the timing and the amount of flexibility with what was portrayed in much of the evidence from yesterday. So the words in paragraph 6 are somewhat closer to the reality of applying sustained yield in Ontario.

Q. During your evidence, Dr. Osborn, you referred to the desire to move towards normalizing the forest, getting the forest into a state where it would be described as normal over the long term, you feel that was something which was strived for.

You also referred to the objective of timber management being to supply mills with wood today and tomorrow, I think to use your words. Can those two

objectives be in conflict?

A. There could be circumstances, depending upon the forest particular age-class structure, area, volume, growth rates, there could be circumstances whereby there was an apparent conflict between that short-term supply and the long-term supply.

For example, in yesterday's evidence there was an illustration of a gap in age-classes and I made mention that that exemplified circumstances, for example, in new Brunswick. And New Brunswick had a little bit of that dilema as to whether they kept the industry going short term, gap in age-classes, shut industry down and turn it back on again. And it was actually thought of, although not implemented.

So, in that case, there is an apparent conflict: Do I literally keep industry going short term and then reintroduce something, or do I try and mix and match those two. In that case, they had a compromise to try and equate and balance those two apparent conflicting pieces of objectives.

Q. And that is what they did in New Brunswick. Are you able to indicate whether there is any black and white answer as to what approach was taken or would be taken in Ontario?

A. Not personally, because I am not practising as a forest manager at the moment, but there must be, in fact - not there must be - there may well be areas in Ontario where there is a dilema between short-term, long-term supply, and the local management team will discuss and resolve what seems to be the most appropriate solution and, in fact, the timber management planning process describes how the audience is affected by such a decision, or party to the discussion on that.

Q. I understand that Mr. Armson will be speaking about wood flow. Is that one strategy that is available to deal with local shortfalls in supply?

A. Certainly.

Q. I want to ask you a question, Dr. Osborn, which arose from a question which I believe was asked by the Chairman.

You were discussing paragraph 13, which describes the imbalance of the forest structure in Ontario, and I had asked you to provide an explanation of what the situation or the effect of species composition was, and you indicated in your answer that the stands which you find in Ontario may in fact have more than one species and you could end up, I think an example were poplar and black spruce, for instance, may

inhabit the same site, and you indicated that poplar has a rotation age somewhat less than black spruce and that could cause you a problem as to how you actually manage that area.

A. Correct.

Q. Can you advise, in that situation, is it not possible to go in to that particular stand and take out the poplar and come back some years later when the black spruce were mature and take the black spruce?

A. Yes, it is possible; it may or may not be managerially desirable.

Q. Perhaps you could indicate why that is so?

A. For two or three reasons. The first reason, in a rather practical economic sense, to go into the stand and only cut a small volume, as was indicated yesterday, may in fact be a rather expensive operation, particularly if you are only allowed to cut, let's say in this example, the poplar and leave the spruce, such that you had to cut in such a way that you don't damage the spruce. It requires skill, expertise, time, it costs money for a relatively low volume. So from a practical and economic reason, there may be some disadvantages in such a practice.

The second reason may well be

silvicultural. In the case that we just talked of, we take the poplar away and leave the spruce, we now have essentially relatively few trees per unit area. Presumably -- let's say we have a 50/50 split, so now we have less spruce trees per unit area left behind, suddenly unprotected from the wind, potentially unstable silviculturally, they may or may not stand up until they become mature and be available for harvest. So depending upon the species, the ones that you leave may not stay as long as you desire.

There is a third reason which is also silvicultural. The actual species themselves, because of the ways in which they either naturally or artificially can get regenerated, you may have a regeneration difficulty.

If you take the poplar away by cutting it, it may sprout. You wait 30, 40 years later, you cut the spruce when they are mature, you may or may not want to put spruce back but the site is now perhaps covered with a certain amount of carcassing from poplar trees. You have some practical problems in the regeneration of the site if you try and conduct the operation as a two-step operation.

So that there is three reasons one has to consider: theories with the species, theories with the

site, theories with the products required as to the practicality of that sort of operation.

MR. MARTEL: So is the whole process of people going in and marking trees and so on, is that a thing of the past then basically?

DR. OSBORN: No, sir, not necessarily. If I come back to my example, in parts of the province with some species - and I am treading on thin ice because I am not a silviculturist in Ontario, from other experience world-wide - some of the trees and the nature of the trees, you can cut and take away, even different species, and those that are left behind will grow well, be wind firm.

In fact, this method is practised in the UK and I have done this where you can do this. You can mark the trees, take some of them, what is left behind is looked after, protected and can be taken when it reaches its maturity. This practice is still possible in Ontario in some circumstances.

MR. MARTEL: But by and large are you saying that we have moved primarily to clear-cut as opposed to any other -- basically, as opposed to other system of harvesting? That is what it sounds like, maybe I am misreading it.

DR. OSBORN: Okay, I understand the

question. I am not sure that we have moved to clear-cut in that the traditional practices of most of Ontario, certainly in the boreal species which is literally where the example is posed, have been predominantly clear-cut since day one.

So have we moved from something else towards clear-cut? I honestly don't think so. We have traditionally in the boreal had a clear-cut type of environment. We haven't had a managed two-story type of forest regime that I tried to describe: You grow the two trees, poplar, black spruce, two different rotations, one growing on 60, one growing on 100.

Now, that mix and marrying of two species with two different rotations on an area certainly is not practised typically in the boreal. It is practised to a certain extent maybe in further parts of southern Ontario, but traditionally it isn't a forest management practise in Ontario.

So in answer to the question, it isn't the sort of thing that is normally done, even though it may appear logically: Why don't we do it that way around.

MR. FREIDIN: Q. And, Mr. Armson, perhaps this is something -- the question that Mr. Martel asked, I understand, as to whether there are

different cutting practises in different parts of the province will be discussed by the panel that deals with harvest; is that correct?

MR. ARMSON: A. That is correct.

Q. And in Panel No. 9 where you deal with principles of silviculture, you will be touching on why there is a difference in cutting methods from one type of forest to another?

A. Yes. In fact, Mr. Martel, I will be dealing with I think some of the elements that would go a long way to answering your question.

Q. I am just wondering whether - and I don't want to obviously get into Panel 9 and 10 - but because the question has arisen here and now, could you at least in a brief way, Mr. Armson, address the question that Mr. Martel made about whether or not marking of trees is a thing of the past?

A. In actual fact, the marking of in certain areas of the undertaking, and I think particularly here in Algonquin region, has grown, it is far more in extent there than it was, let's say, five or 10 years ago.

So in certain areas and with certain species and, as Dr. Osborn pointed out, certain conditions with certain management objectives, a

species - in this case hard maple - can be managed on that basis.

There are - and I don't want to go too far here - but some species you have an option because of the biological nature of the species to do this kind of cutting or that kind of cutting. With other species it is -- it can be very, very -- a narrow band, you have very little option, very few options in terms of dealing with it and the factor that enters in is the nature of the site. But I will be dealing with this in Panel 9.

MR. MARTEL: Thank you.

THE CHAIRMAN: Mr. Freidin, could we break now?

MR. FREIDIN: Yes.

THE CHAIRMAN: We will take a morning break of 20 minutes.

---Recess at 9:30 a.m.

---Upon resuming at 10:00 a.m.

---Discussion off the record

THE CHAIRMAN: All right. I think we can proceed and if anybody cannot hear, please let us know and we will work from there.

MR. FREIDIN: Q. Dr. Osborn, throughout the evidence in relation to sustained yield, except for

the reference to Document No. 2 which referred to there being various options in terms of dealing with the land, there has been no reference to non-timber values and the effect that they may have on timber management decisions.

Is there a reason for that?

DR. OSBORN: A. You are correct and, yes there is the theory, the background, the concepts that were explained yesterday are perhaps fairly well documented and fairly well put together as far as timber are concerned evolving over 100, 150, 200 years.

The corollary in terms of other uses of the forest is not so well documented and/or observed, to my knowledge, in a world-wide sense and certainly not in this province. So the whole rationale that was explained yesterday was done very deliberately as a timber concept because at least there we can explain, in a timber environment, the rationale, the theory, the methodology and what that means in a timber management practice.

The second part of the rationale, second part of the reason for why to do that is where in the world other jurisdictions have tried to embody some of the thoughts and ideas, the concept of sustained yield certainly as was quoted about half an hour ago is

equally applicable to other resources in the province.

However, the practice of that and the methodology and the thinking through of that which have been attempted for example, in this country, in Alberta and, for particular example, both legislatively in practice in the United States has been fraught with considerable difficulty in trying to explain, understand and practice it.

And so it was thought useful in presenting this evidence to you to try and explain sustained yield, forest management objectives, age class distributions, amounts, variability and supply in a timber context which is fairly straightforward to follow, without bringing in all of the additional complexities of the other uses of the forest.

So there was a very deliberate decision made to portray the timber aspects.

Q. Are the other aspects and other uses of the forest going to be explained in later panels, however?

A. Yes, when we do describe in later panels how forest management is actually practiced at the management unit level. In later panels there will be a much more detailed explanation of how the theory and practice that was portrayed yesterday in timber is

intermixed with and folded with those other uses of the forest in ending up with the overall management of the resource for the area and the practices that ensue.

Q. You have indicated that where other jurisdictions have tried to embody the practice and methodology - you referred to Alberta and the United States - there it was fraught with difficulty to explain and practice it.

Could you just expand on what you are referring to when you are saying, other jurisdictions trying to embody the practices and methodologies, I didn't quite understand what you were referring to.

A. Other agencies, both in this country and in the United States, have tried to practice total resource management. In fact, the United States has legislation to that effect.

Q. What do you mean by total resource management?

A. On the natural resource environment - I will use the word forest because it is particularly on the forested land that this is practiced - to have those management objectives and practices that deal with the timber, the water, the habitat for fish, animals; so the natural biological entities that exist on that forest, be they vegetation, be they animals,

and the associated, I will use the word, environment in totality that exists on that piece of real estate and try to manage that with one overall set of objectives.

Q. And when they do that with one overall set of objectives, are all those objectives contained in one plan?

A. Here I am not exactly sure of the exact mechanical administrative procedures in terms of whether they all end up in one plan or in several plans.

Certainly in the objective statements, because of the actual systems programming work that they go through, there is an effort to contain those objectives in one objective statement. In fact, there is a whole computerized methodology that tries to deal with this.

THE CHAIRMAN: Do you have any idea why they are not successful in doing that?

DR. OSBORN: This is personal communication, so it is not coming from some written document I have read, sir. A matter of practicality, a matter of trying to find enough people knowledgeable to understand all the facets - enough experts, if you like, to understand interactions, enough people to collectively come together to practically implement, in

all cases, some of the sequence of events or work out an overall way of resolving some conflicts.

Some uses of the forest are mutually exclusive, some of them have a range of options and some of those seem to work, some of them seem to be acceptable; it is a learning device and, certainly, with the U.S. Forest Service, there has been a learning curve in this and personal communications indicated: Hey, this isn't easy, so don't expect to walk into it just because somebody legislatively said it is the way of doing business. It is very much a learning curve of trying to marry these things together.

MR. MARTEL: But it sounds like you are saying it is nearly impossible, if not impossible to do them both?

DR. OSBORN: I apologize if that was the impression I created, sir, because it was not the intent.

All of management in the resource is a continual learning challenge. We had diagrams of adaptive -- the philosophy, if you like, is: Hey, let's try to do something better. I am hoping it wasn't be the reaction of: Hey, I throw up my hands and give up. No, it is worth something striving for.

All I am saying is the experience that

has certainly been in the U.S. is it isn't easy. It doesn't mean stop, it means there is a challenge: Okay, let's get our heads together and try and sort it out which, in essence, is the practice being advocated in the timber management process in Ontario.

So it is not: Give up, walk away just because it appears complicated, that just means there is an additional challenge to take on.

MR. MARTEL: But you said - and I am not trying to be argumentative - but I think you said that if one lists the objectives and practices that were established, for example, in Alberta or in the United States and tried to put them into one specific document that, in fact, it became extremely difficult at that stage. I thought it sounded almost as though one were surrendering and saying one picks certain objectives and then tries to manipulate the other into the existence.

I am not trying to read something in it, it is just the way it was presented left me with a feeling that maybe the two aren't compatible.

DR. OSBORN: In some cases, sir, the objectives for the different uses of the resource may not be compatible. You may have to have a sequence of events, or one, or the other. In fact, there will be

later panels in the Crown's evidence that will demonstrate the situation and the ways in which Ontario tries to resolve them.

So, in some cases, there may well be difficulties in resolving conflicts, but the impression I want to leave you with is that that is a challenge to be undertaken, not a challenge to throw up one's hands and walk away from.

MR. FREIDIN: Q. Let's just go back then. When you referred to the Alberta and the U.S. experience you indicated that those jurisdictions or the approach used in those jurisdictions was fraught with difficulty in order to explain it and to practice it.

What were you referring to? I just didn't understand your answer.

DR. OSBORN: A. Fraught with difficulty is an explanation. Yesterday we went through an explanation of some of the concepts and background and methodology from a timber facet of this alone. It wasn't easy, it was quite complicated, it required some thought process.

Just as complicated, but not as well thought out as I understand, are the similar sorts of rationale, lines of logic in the other uses of the

forest. So each of those has its own difficulties and explanation.

Now, try and imagine trying to intermingle all those and take them all into one's account all at the same time. Fraught with difficulty in explanation, understanding, trying to explain it to participants.

Q. So you were speaking then of -- was it that difficulty in trying to explain both aspects of forest management in the wider sense - if I can say that - did that have some play then in dealing with timber management only in this panel and dealing with non-timber values in other panels?

A. Yes, from two points of view. The first was the explanation was deemed to be easier to talk about the timber scene which is relatively well explained and documented; secondly, in terms of expertise, my background is in forest management, in particularly the timber events, sustained yield, forest practices, forest measurements, not as a broad scale ecologist in all the other facets of natural resources.

Q. Okay. Could we turn to the next topic which is the topic of management units.

MR. FREIDIN: I have reviewed the transcripts from Panel No. 1, Mr. Chairman. The part

which really was covered almost completely by Mr. Monzon were paragraphs 25 -- actually 24 through paragraph 28.

So Dr. Osborn is going to speak to those briefly and perhaps just add a little bit of information as to where some of those management units are, and we will may every attempt not to duplicate.

THE CHAIRMAN: Very well.

MR. FREIDIN: Q. In the first exhibit that you referred to in relation to sustained yield, Dr. Osborn, you indicated that the chart, the axis of importance for estimating supply was for a specified area and you indicated that that area would include a management unit; is that correct?

DR. OSBORN: A. I indicated that was the typical piece of specific area alluded to.

Q. How long have there been management units in Ontario?

A. Since the late 1940s, or since the 1940s, an effort was made to select four locations as experimental management units to see whether this idea of management on a particular defined piece of real estate made sense in Ontario.

Q. What was it that caused someone to experiment the practising on a defined land area?

A. As far as I understand historically, there was really two pieces, or two driving parts behind that. There was certainly discussion apparently here saying, from foresters in the then Lands and Forests, in the management sense of looking at what had happened in other parts of world; Europe, the Commonwealth in terms of forest management practices, why is it not applicable in Ontario. Let's try it, let's experiment.

The second driving force in a way would be parts of the recommendations of the Kennedy Commission which echoed that such practices seemed appropriate in Ontario and should be followed.

Now, the exact timing and the logic of those two driving forces I cannot comment upon because I am going from hearsay evidence.

Q. What were the practices that were going on in Europe and which were referred to in the Kennedy report which you referred to?

A. Well, both European and, in fact, parts of Asia were practising forest management in a defined series of management objectives, concepts of sustained yield, allowable cut calculations, that sort of practise had been going on, certainly in Europe, since the late 1700s, early 1800s.

In countries like India, for example, since the 1850s, 1860s. In other parts of the world this sort of practice had been going on, of managing on a defined piece of real estate, some specific objectives, some yield regulation of the resource.

Q. I understand that these experimental management units were created in the period 1943 to 1945 as referred to in paragraph 20 of the witness statement?

A. Yes.

Q. And were there any management -- well, what was the result of that experiment?

A. The general conclusion was that it was possible to organize the inventory data, the data required as one of the fundamentals for management, to organize those data, to speak to those pieces of geography, to speak to those units.

The second was the idea and the practise of analysing, looking at, attempting to practise what was shown just before the break in terms of plan, practise, look at what happened. That seemed to be feasible, passable and proving useful in being able to estimate what could be supplied and what was supplied and keeping track of it.

That sort of experimentation was in fact

achievable, apparently, on those four experimental units.

Q. I understand the forest experimental units are described very roughly geographically in Document No. 16?

A. Which is given on page 127 of the evidence.

Q. Yes. The witness statement indicates that forest management units were to be created as a result of some instructions given to district foresters in 1953?

A. That's correct.

Q. And that's referred to in paragraph 21 of the witness statement?

A. Yes.

Q. And the two types of units that were created at that time, Crown units consisting of areas of a long-term licence to a company and the boundaries were described in the licence, and Crown units covering the remainder of the area in the district.

A. I am not sure whether you realize, but you misquoted. The first kind of unit of a long-term licence are company units. Either I misheard you or you didn't say what I thought you said.

Q. Well, if I did do that -- did do it

improperly, we are even.

MR. MARTEL: Crown units you said.

MR. FREIDIN: Yes. I meant to say -- to read paragraph 21, the company units and crown units.

Q. What were the criteria which were used in determining the boundaries of management units at that time?

DR. OSBORN: A. On page 128 in the evidence is the list of the criteria that were used in the determination of the boundaries of those management units as required starting in 1953.

The first item was a recognition that the existing long-term licences would be taken as one of the criteria for the boundaries.

The second was that the township or the base map boundaries would be used as a licensed boundary. A word of explanation: Parts of Ontario in a survey sense are demarcated as townships, typically southern Ontario, and extending up in to particularly the north and the eastern -- the northeastern parts of Ontario are demarcated into townships.

As you move westwards throughout the province, less and less of the area is surveyed as townships, particularly in 1953. In parts of the west there is no township fabric, particularly in the

forested area.

However, the way the forest inventory is organized and the way records are kept and, in fact, there is some legal connotation in the township fabric, so it seemed appropriate to try and make the forest management unit boundary coincide with this already existing township boundary for both administrative and legal purposes.

Where the township fabric does not exist or did not exist in 1953, again to make it easier to organize the data, the inventory data particularly, it seemed appropriate to use the map sheets as the boundary of any particular licence. You may refer to this later on -- sorry, the map sheets for any boudary of the unit.

The third criteria was to tie into the then existing 1953 district regional boundaries. And in fact, in general, the demarcation of the management units in '53 was the large licences and then let's try and carve up the rest of the Crown land according to the then district boundaries of '53.

So the third item of administrative boundaries was quite appropriate.

Q. In relation to -- you indicated where there were no township boundaries, reference could be

made to map sheets?

A. Yes, sir.

Q. What are they?

A. In trying to describe the problems in trying to portray in paragraphic, graphical format, a province, any mapping agency - be it provincial, be it federal - because of the matter of scale, they are trying to show data at a relatively large scale breaks its description of the area, in this case Ontario, into a set of map sheets.

The Federal Government had the NTS 1:50,000 map sheet series. The Provincial Government has or has had - and we will talk about that more - a 1:15,840 map scale set of map sheets.

Now, so the province is broken into, if you like, unique non-overlapping cells which are map sheets.

Q. Each map sheet covering a certain amount of area?

A. Correct, depending upon the scale and the size of the piece of paper.

Q. All right. How do those areas in the map sheets compare to townships?

A. Typically in Ontario townships are six mile by six mile, or nine mile by nine mile. 36

square miles, 81 square miles. The Ontario base map series which exists primarily in the central and northwestern part of the province, the map sheets approximate a hundred square miles.

So that the Ontario forest resource inventory base map series at that time were approximately a hundred square miles. So they were larger and they were not square as most of the townships are. Some townships, especially in southern Ontario, are quite irregular.

The fourth item that was used as a criteria for management units were geographical features, and I believe there was some reference to this in Panel 2.

In 1953 the geographical features of interest, because of the ways in which the forest was both accessed and/or harvest, sometimes were parts of land. We were dealing with watershed method of management, what was in the watershed in terms of access patterns and extraction patterns. So the geographical feature that may well have been of concern in '53 were heights of land.

From trying to organize a data point of view, that is a real nuisance because it is very hard to find any two cartographers who would agree where is

the height of land. And that causes enormous difficulty when you are trying to legally define the boundaries of a management unit.

Be that as it may, since '53 methods of forestry and access and harvesting have changed such that now a geographal pattern we now look at may well be the river, the lake and we are going completely converse to what was the focal point of the unit in '53, which may have been the river, now well may become the boundary as of today.

Recognize in that list the geographical features in 1953 were very much determined and related to the mode of operations in the late 40s, 1950s.

The last item was access patterns, a little bit related to Item 4, but also cognizant of what were the main roads, railroad lines, how did the wood get extracted, with the concept of the access pattern being the focal point and around the access pattern you having a timbershed concept, what was reachable from that focal access pattern.

So in that list of criteria there was a range of thoughts given to the way in which the boundaries in 1953 were established.

The predominant ones were the existing long-term licences and the then administrative fabric,

as given in Item 3, region/district.

Q. The witness statement indicates in paragraph 22 that by 1958 when the forest -- provincial forest resources inventory was completed, 87 Crown units and 24 company units had been created.

Was there some connection between the preparation of the forest resources inventory and the creation of the units referred to?

A. Yes. The forest resources inventory was commenced in the late 1940s, partly coincident with this thought about management units. The creation of the management units by 1958 more or less coincided with the completion of the first complete provincial inventory in Ontario which, in fact, was completed in 1959.

So the time it took to create the management units and collect and compile the forest resource inventory data relevant to those units, that took some periods of time. So the two ended up being more or less complete; I have got my description of my unit, I have got it demarcated, and I have got the intended forest resource inventory data that speaks to that unit.

Q. And I understand that as of today there are 99 management units in the area of the

undertaking?

A. As I understand it, yes.

Q. And before I ask you to refer to an exhibit or document which will show where those particular units are, in paragraph 20 you refer to management plans being part of the experiment.

When were management plans first required for the management units which were created from the late 40s into the late 50s?

A. In all honesty, I do not know the exact date of when that was in fact a requirement.

As far as I can remember, the initial manual about management planning, the first edition I think was 1948, in terms of a manual. Since that time there has been a series of editions of manuals requiring and describing the management planning process.

The exact date of when did somebody say: This is now essential, I am not aware of and unsure of.

Q. The first Timber Management Planning Manual is just an extension then or a new one in a series which started in 1948?

A. Correct.

Q. And Mr. Monzon did describe Crown management units, company management units, forest

management units.

MR. FREIDIN: Perhaps, Mr. Chairman, I can just refer you to the evidence of Mr. Monzon, where you will find that, in the transcript of May the 12th at pages 319 to 325.

Q. Dr. Osborn, I understand that you have a map behind you which in fact describes the various type of management units in Ontario?

A. Correct.

Q. And would you just explain to the Board how to read that particular map?

A. Before I do that, I would like to draw one other piece of information to the Board's attention.

In the evidence on page 129 is a small-scale copy of this particular map showing the location and approximate size of the management units in the area of the undertaking, and this is sort of a small-scale echo of that large map I will refer to in a moment behind me. On page 130 to page 132 is a list of those units with some of the very basic statistics that go with each and every one.

So I want to bring to your attention as the map on page 129 exemplifies that the units range in size, in total, as shown on the map and as indicated on

pages 131 to 132 because in that list there is the total area as the second column, in the third column on the list -- the first is a number, the second is a total, the third shows total area.

However, the reason for bringing your attention to pages 130 to 132 is to also indicate the fourth column which talks about the total Crown area and the last column that talks about the production area. So even though the unit's total area may be large, small, variable, I bring your attention to the fact that it is the production area, the productive forested part of the area that is the greatest area of concern, not the only area, but the greatest area of concern that we are talking about in these particular management units.

This is a small example of information about each and every unit that exists.

MRS. KOVEN: Excuse me, what are total C areas?

DR. OSBORN: Total Crown area. Crown as an ownership as opposed to patent land or Indian reserve, which will be described at more length when we talk about the forest units.

MRS. KOVEN: And how do you read the three different types of management units, for

instance?

DR. OSBORN: Oh, in the map showing in page 133? With relevance to the question --

MR. FREIDIN: Q. If I could just go back, in that list that you referred to, the last column production area--

DR. OSBORN: A. Yes.

Q. --refers to what?

A. A subset of the forested area and the subset will be explained when we come to its definition when we talk about the forest resources inventory in more detail.

Q. And there is a component that you will be explaining which deals with that particular column called the production forest; is that what you intended?

A. That column relates to what is called the production forest in the forest resources inventory. It is one of several definitions and subsets of data within the forest resources inventory.

So the map that is given on page 133 in the evidence is echoed in a more easy to read form and fashion in this particular exhibit, this particular map which essentially shows the limit of the undertaking, the northern boundary, down to the southern boundary in

terms of the colouring. The map, again, shows the management units.

In answer to Mrs. Koven's question, the green on this map sheet are the areas that are Crown management units, the yellow speaks to forest management agreement kinds of units, and the blue relates to areas that are company management units at this point in time.

So the map shows management units, at this point in time, the map shows the three major kinds of unit in a coloured sense.

THE CHAIRMAN: Dr. Osborn, would you mark that Exhibit 82, please.

DR. OSBORN: Yes, sir.

---EXHIBIT NO. 82: Hard copy map describing three different types of management units by colour: green for Crown, yellow for forest agreement, and blue for company management depicted at page 133 of Exhibit 78.

MR. FREIDIN: Q. Now, Dr. Osborn, in relation to the three types of management units which are described on page 7, 8 -- pages 24, 25, and 26 of the witness statement - again, I don't want you to repeat the evidence that Mr. Monzon gave about who does what activity on those management units - but is there something about each of those units that you would like to comment on before we move on to the subject matter

of the forest resources inventory?

DR. OSBORN: A. Two main comments and one has already been alluded to previously. For each of those three kinds of units, there has been, since the 1940s, a manual describing the management plan requirements, and since the 50s there have been management plans written to a greater or lesser extent in a very variety of ways, and I will explain why in a moment, on those three kinds of units, such that the manual that is being described today is a continuance in that series of manuals.

The responsibility for that plan varies on the three units. On Crown management units, the responsibility for the plan rests with the Crown in totality; i.e., the description of what is to be depleted versus -- or in addition to the description of the silvicultural regeneration facets.

On the company management units, which was the second historical one back in '53 - company from Crown - on the company management units, companies have the obligation to write management plans particularly that part dealing with the harvesting and, for legislative reasons at that time, the Crown wrote and put together the part of the plan dealing with the silviculture and regeneration.

On the third kind of unit that was created starting in 1980 which are called forest management agreement areas, units, the company has the responsibility for writing the plan, describing the forest management operations - and this was described by both Mr. Monzon, actually it was referred to also by Mr. Armson - that was a manual that covered planning on those three kinds of locations and this has been practised through time.

Q. Okay, Dr. Osborn, if we might move on to the area of the forest inventory which begins at paragraph 29 of the witness statement and runs through to paragraph 84 of the witness statement.

Tell me when you have got all your material together.

A. Okay.

Q. In Document No. 3 at page 67 of the witness statement, one of the requirements for predicting or quantifying the supply of wood from any given land area is described as being an inventory of the forest itself.

Would you advise, Dr. Osborn, does Ontario have such an inventory?

A. Yes, it does.

Q. And could you advise what

geographical area that inventory covers and how often does it take place?

A. In answer to the first of the two questions: If you turn to page 137 you will find a copy of a map that indicates the northern limitation of the forest resources inventory. The document on page 137 actually shows the aerial photography coverage from 1977 to 1984, but this map and this document, page 137, illustrates the northern limit approximately of the forest resources inventory typically approximately 52 degrees north in the northwest, there is a gap, drop in and around the Albany River...

Q. I am just wondering Dr. Osborn, do you have an overhead of this particular...

A. No, I have the hard copy photographs which are easier to read, but for the answering of the question in terms of the coverage, the document on page 137 indicates approximately the northern limitation and the southern boundary in the extreme southern part of Ontario.

Q. I am just wondering, for the purpose of the record, perhaps we could file as exhibits the clearer documents. Perhaps the Board could follow that document as opposed to the document in the witness statement which they may have some difficulty dealing

with.

You gave me four documents, Dr. Osborn. What documents are they? Do they correspond to documents which are in the witness statement?

A. Yes, they cover the four maps illustrated on pages 134, 135, 136 and 137 and they illustrate the aerial photo coverage with regards to forest resources inventory from 1956 up to, on page 137, the coverage up to 1984.

Q. All right. So --

A. Now, as I mentioned --

MR. FREIDIN: How do you want to mark those?

THE CHAIRMAN: Why don't we mark them, Mr. Freidin, Exhibit 83A, B, C and D with A being the corresponding map to page 134, B being the corresponding one for 135, C being the corresponding one for page 136, and D being the one for page 137.

---EXHIBIT NO. 83A: Hard copy photograph corresponding to page 134 of Exhibit 78.

---EXHIBIT NO. 83B: Hard copy photograph corresponding to page 135 of Exhibit 78.

---EXHIBIT NO. 83C: Hard copy photograph corresponding to page 136 of Exhibit 78.

---EXHIBIT NO. 83D: Hard copy photograph corresponding to page 137 of Exhibit 78.

MR. FREIDIN: Q. Perhaps when you are referring to those particular documents, you could refer to the exhibit number then.

We were looking at Exhibit 83D.

DR. OSBORN: A. To answer your question as to the extent of the coverage, 83D, which is equivalent to page 137, shows the northern extremity being approximately the 52nd parallel in the northeast and running east across that and a dip around the Albany River and ending up approximately 50 degrees north in the northeastern part on the Quebec border, and the extension itself from that northern limit would cover the entire province.

So in terms of your question on coverage it goes from that northern limit to the extreme southern part of Ontario.

Q. And are you able to give an approximation of the area that is in fact covered?

A. It is approximately some 61-million hectares.

Q. And the second part of my question, Dr. Osborn, was: How often are these inventories taken?

A. The practice is on a 20-year cycle.

However, I would like to bring to your attention the material that is on page 134 or 83A which shows the aerial photo coverage from 1946 to '57.

On that document which is given on page 134, the aerial photo coverage for the province was completed on a 10-year cycle, '46 to '57, and there was an inventory produced in that time horizon, again, coincident with the formation of those management units as was previously explained.

Since that time, the forest resources inventory has changed to a 20-year cycle; however, from 1957 there was a 10-year aerial photography cycle. The inventory was done on a 20-year cycle, but every 10 years we did complete aerial photo coverage of the province to that northern limit described.

There was a reason for why that was done and there is a reason for why that has stopped.

At that time, in the 40s and 50s and 60s and into the 70s, the only complete provincial set of maps covering the province at the scale of 1:15,840 - that large scale - was that produced by the forest resources inventory of Ontario. Those maps were used by a variety of people needing maps at that scale. Federal coverage was not complete and was at 1:50,000.

The FRI therefore provided the underlying

planimetry: drainage, lakes, rivers, roads, railroads, power lines. Underlying cartographic planimetry at that scale was provided by the FRI system and, in addition, on top of that we put the tree cover. That process was continued and, on a 10-year cycle, we would fly and revise that planimetry as a service to users just to keep track of changes in drainage and roads with respect to the tree cover.

In the 1970s, middle of, the provincial government decided for geo-referencing reasons to try and understand who was going where, to introduce an Ontario basic mapping program.

There was an effort, in fact a declaration made by the Premier at that time that the Ontario basic mapping program and its way of referencing where anybody was, would become the de facto standard for the provincial government in totality.

And this was because there was enormous confusion at that point in time in trying to send an ambulance and a policeman and a fireman to a certain location when they had three different maps and three different locations. The foresters were just as guilty in trying to find where the forest was.

So in 1975 the Ontario basic mapping

program was introduced as the de facto provincial standard and the foresters agreed that when the inventory was redone for an area, and the area was covered by an Ontario base map, the foresters would use the Ontario base maps planimetry as its source of planimetry for the forest stand map.

That being the case, where the Ontario base maps exist, the need for the FRI to refly and update its own planimetry diminished and so the 10-year year flying cycle has now been stopped and we are completely on a 20-year inventory cycle.

But to try and explain why there appears to be - we cover the province every 10 years photographically, if you look at pages 134, 135, 136, Document 83A, B and C - explanation of why that inconsistency when I say a 20-year inventory cycle and the province is flown on a 10-year basis.

To further continue the answer to the question, it is a 20-year schedule on average. That does not mean that we automatically go back to an area just because year 20 comes up. And in the evidence on pages 138 to 146 is a description of the FRI schedule covering the 1984 to the year 2001 showing that we have forecast - unit-by-unit, area-by-area - when do we plan to do the inventory which approximates returning on a

20-year cycle. But if you look closely within that list of pages, some units may be revisited and re-inventoried more frequently than 20 years.

So this schedule is flexible. It also is another indication of estimates, and when we speak later about the inventory, there have been some changes to this to accommodate users' requirements. So though officially we practice this on a 20-year schedule, there is some flexibility within that schedule.

Q. Dr. Osborn, the document that you just referred the Board to at page 138 is the schedule for 1984 to 2001, in the very first line indicates in the third item management planning schedule.

I also note in paragraph 30 of the witness statement that it states that the province conducts the inventory on a management unit basis.

Could you advise why the inventory is done on a management unit basis, and what type of management unit is being referred to?

A. It is done on a management unit basis because the forest resources inventory, much as we explained forest mensuration yesterday, is a set of numbers, a set of numeric descriptions of the forest that are an underpinning or a set of data necessary for the description of, the planning of, and the recording

of management.

So the forest resources inventory is very much a means to an end as opposed to an end in itself; it is a set of data that go to aid management. To that extent, the schedule and the demarcation and determination of which management units are to be inventoried is driven by the demands, requirements of management planning.

Such that, on page 139 in the document, there are a series of column headings and I would like to go through those column headings to illustrate which of those deals with management planning because this is the driving force behind when this schedule is put together, how this FRI schedule is put together.

The first column reading F.Photo -- oh, sorry, before I explain that, the explanation of the terms, the column headings for pages 139 are given on page 138.

Q. Perhaps you may want to go through on page 139 across the page and just indicate how you read one particular line, that would probably be of assistance.

A. The first column is F.Photo which is the future photography year. This essentially describes in this particular document for 1940 -- in

1984 to 2001 the planned intent of the FRI. Future year photo is the first column.

The future delivery of the FRI is F.FRI and you may notice that that typically is three years after the year of photography. An explanation of why will be given later this morning.

The next column is the F.MP, the future management planning period. And if we come down on page 139, down that F.MP column to the F.Photo of 1985, so under F.MP column which starts off not available, inactive, inactive, inactive, if you come down to the year of photo of 1985, the first line in there reads not applicable, the next line reads 9010, which in infers that the management planning period is running from 1990 to 2010.

With reference to that particular schedule, which happens to be for the Auden unit, the planning period is 1990 to 2010. The photography would take place in '85, the inventory would be complete in 1988, the data would be available for the two years to prepare the plan for approval by the year 1990.

Now, that F.MP, that year of the planning period is what drives, for the most part, when the FRI is done. We work backwards from the planning period, how far, how much lead time is needed to provide the

data for those plans given the way the FRI was done and the way the planning process takes place.

The next column goes on to describe the present management plan, but the point I wanted to make was that this document shows that the dates of the planning, predicted dates of the planning periods, are what determines this particular schedule recognizing, as was shown in that adaptive planning diagram back earlier this morning, there are events take place that causes us to revise and change this schedule in certain circumstances.

Q. Now, the reference again is made in your evidence to the line -- or the preparing of the inventory every 20 years. And could you explain why it is every 20 years on average?

A. The initial 1949-50's management planning schedule which was put into place in Ontario echo that which was practised in much of the rest of the world. In fact, in virtually all the British Commonwealth countries a 20-year planning schedule is almost a de facto standard, anywhere in the Commonwealth is the same sort of time horizon. Canada echoed that and, in fact, in Ontario we have initially a 20-year management planning horizon. The document, the management plan was written for a 20-year

short-term period as well as a long-term look at the rotation life.

The FRI, as a means to provide the data for that management plan, therefore geared itself to provide data on a 20-year schedule. Every 20 years there was to be a new plan, every 20 years there were to be a new set of data describing that unit. And so the 20-year FRI schedule was merely a handy blob with the management planning cycle at that time.

Q. And when the inventory being taken every 20 years was developed, was there a new plan prepared each five years, as is the case in the present timber management planning process described in the Environmental Assessment Document?

A. In a similar but not exactly the same fashion. Within the 20-year management plan horizon and 20-year management plan document, there was a subset time, subset document called an operating plan. The operating plan's time horizon varied from five to 10 years.

Now, this was similar to, but not exactly analogous to, the existing timber management planning process. There were some slight changes.

So the 20-year time horizon had within it a document speaking to a shorter time frame.

Q. And will you later in this panel be describing any methodology or means which are employed in timber management to update the information provided by the inventory between the taking of that inventory every 20 years?

A. Yes, there will be some procedures described that will take the forest resources inventory geared specifically to provide data for the 20-year management plan and describe how that may, where required, be supplemented by additional data collected for a smaller piece of geography, a subset of the management unit for which operations are planned in the shorter than 20-year time horizon.

Q. Is the 20-year period that you referred to a rigid time frame for the inventory?

A. No, for two reasons. The first is that in the course of events in the 20 years events may take place of such a catastrophic nature that a re-inventory is suddenly required.

We had an illustration yesterday in the actual age-class distributions, for example, in Red Lake, where there had been a large fire and a very large area of barren and scattered. Such a traumatic change may necessitate a re-inventory to let's assure ourselves what we have got there to replant. So the

20-year cycle can be upset by circumstances like that.

There may be other managerial reasons why we wish to change the cycle. Areas may become of much greater concern in terms of timber supply or forestry operations and other units less active or less activity going on. We may wish to, therefore, change that 20-year cycle to pay more attention to those units where there is a lot of changed activity occurring in the normal course of events. And both those two events have happened to cause variations from this particular schedule.

Q. I take it then in that case one of the units, the inactive one, might not have an inventory done within a 20-year term but would have to wait until some time later?

A. Yes, we are into a set of fixed resources, sets of priorities, and we try and managerially sort of pay attention to those units where there is the most activity.

Q. Are inventories taken of the forest when forest management agreements are signed?

A. There has been a mixed history to this question. We have tried, as I have indicated before, to fit the inventory cycle to the planning cycle. In the formation of forest management

agreements, the decision to sign the agreement happened without necessarily any connection or being driven by anything to do with previous planning cycles.

So in some cases in forest management agreements the agreement could well have been signed completely out of sync with the FRI schedule.

In terms of practicality, there wasn't time necessarily to do a brand new inventory for that FMA, forest management agreement area, and so alternative methods were found to take the existing set of FRI data and bring those up to the date of signing. This required supplementary information, some ways of estimating how do we take the data that was done previously and bring it up to the actual date.

Some of the earlier forest management agreements were certainly, their data was arranged this way. Some subsequent forest management agreements, the dates have coincided when a new inventory in fact has been produced.

MR. MARTEL: I think I heard you say that new methods were used to compile the data?

DR. OSBORN: Yes.

MR. MARTEL: Could you just give me an example?

DR. OSBORN: Two things very

simplistically were done. The changed data that we actually had records of, what had been cut, what had been burnt, were used to take away from the inventory of 1975; since '75 to 1980: What's been cut, what's been burnt that is taken away from the inventory of 1975. That is also put back, what has been regenerated. That's the first step.

The second step, and the more difficult part, was how do we take that 80, 90 per cent of the forest - for which we have a description in 1975 on which the only thing that has happened is it has grown - how do we take that '75 data and grow it to 1980.

That was relatively new, the idea of modelling, growing the forest through time to estimate as of 1980 what that 90 per cent of the forest may appear to be. So we have a technique of modelling or growing the forest that wasn't normally done because normally you would have a brand new set of data as when you started your plan.

That practice was, therefore, introduced particularly when forest management agreements were formulated back, they were formulated in sort of '78, '79, suddenly in 1980 five were signed.

I personally was responsible for the

effort required to take the data of a variety of ages for those five FMAs and bring it up to the date of signing. Much of that work involved the assumptions required in the growing of the old data to estimate the forest as of the date of signing.

MR. FREIDIN: Q. Dr. Osborn, what are the main products of the forest resources inventory?

DR. OSBORNE: A. There are three main products. So if I was to give you the forest resource inventory for any management unit, I essentially would give you three main items.

I want to use an overhead that is not in the evidence but it lists them, and I want to go through this list and then physically show you what the three products would look like.

The first of the three products is a set of aerial photographs. A rather poor representation of this is on page 179 of the evidence.

THE CHAIRMAN: We will mark this Exhibit No. 84.

---Exhibit No. 84: Set of aerial photographs corresponding to page 179 of Exhibit No. 78

DR. OSBORN: And you would get, for any unit, a set of these photographs which will provide

complete coverage of the unit in question and the photographs may be at one of three main scales. As indicated on the diagram, the scales may be 1:20,000, 1:15,840, or 1:10,000. The choice of scale will vary primarily with where you are in the province, what unit you have in the province.

The example you are given is at 1:15,840, that isn't written on the photograph, it is inherently part of the contract that gave rise to this production.

So the first thing you will get will be a set of aerial photographs and, in fact, you will get a set of photographs that have been interpreted; that means somebody, a photointerpreter, has looked at the photograph and drawn lines on the photograph demarcating forest stands and other areas of forest, other classes of forest. We will speak about the process and how this is done a little later.

The second major output from the forest resources inventory are maps. There are primarily two kinds of map; there is what is called a forest stand map and what is called a composite map.

An example of a forest stand map is given on page 180, and 180 has a heading that says it is a Forest Stand Map in Red Lake Crown management unit. As indicated yesterday, Red Lake Crown management unit is

up around Red Lake, northwestern Ontario.

The document and the picture at page 180 was given to exemplify what this looked like in general; however, a normal scale copy of that exact same map is given here as an exhibit.

THE CHAIRMAN: Mark that Exhibit 85, please.

MR. FREIDIN: I am just wondering, did we mark that interpreted aerial photograph as an exhibit, the one which was in fact the reproduction of page 179?

THE CHAIRMAN: It is Exhibit 84.

MR. FREIDIN: All right. Thank you.

---EXHIBIT NO. 85: An example of a forest stand map corresponding to page 180 of Exhibit 78.

DR. OSBORN: This is an example of a forest stand map, again, it may be at one of three scales. To date, the scale of the photograph and the scale of the map have been the same. If I produce a 1:20,000 photograph, I usually give the user a 1:20,000 map sheet. It makes it mentally easier to translate one to the other. In this example you have a 1:15,840 photograph and a 1:15,840 map sheet.

On page 180, the upper right-hand corner - oh, as is found in the book in the upper left-hand corner - what is the northeastern corner of the map

sheet. On page 180, it is highlighted, there is a line drawn around that particular part of the map on page 180. The particular corner of map has a road with a very sharp bend in it and that particular corner of the map is given in more detail on pages 181 of the evidence.

And we have shown this because we will come back to this to fully describe the sorts of details and descriptions given on this particular product. Again, we have -- on that Document 181, we have that road, that highway, which is Highway 105, with a sharp right-angled bend in it and that in turn corresponds with the photograph you got given.

So the aerial photograph, which has a sharp right-angled bend in the road, as well as a Hydro cut, echoes -- is the same area as the document on page 181 which, in turn, is a corner of the document on page 180, Exhibit 85. So we have a link between photograph and forest stand map.

The second map that was alluded to was a composite map. The composite map literally is a taking of the forest stand map as given in Exhibit 85 - which I mentioned was at a scale of 1:15,840 - and if we take that map and its neighbours and we change the scale to make it smaller at 1:50,000 and we add, as I say, its

neighbours, and those map sheets, forest stand map sheets that are in the Red Lake management unit to present a picture of the unit, we end up with a composite map.

And in this case because Red Lake management unit is of a sufficient size, we can't fit all of it at 1:50,000 on one composite, it is made up of two. This is half of Red Lake, and the particular forest stand map sheet of Exhibit 85 is echoed by being this particular area, the area on the composite map.

MR. FREIDIN: Q. Perhaps you could just draw in colour across that area.

DR. OSBORN: A. Yes. I am not sure whether it may be easier, Mr. Chairman, if - except you visit what these look like to see this relationship or whether you want to do this some other time - but this sort of drawing together of this flow, this exhibit exists and there is no way you can see the detail without looking at it closely.

THE CHAIRMAN: Okay. Let's mark it for the time being as Exhibit 86. Are you going to be leaving these for a while here today, Mr. Freidin?

MR. FREIDIN: Yes.

THE CHAIRMAN: The Board will endeavour to look at it more closely later today.

---EXHIBIT NO. 86: Detailed composite map of a section of Exhibit 85.

MR. FREIDIN: Q. So the block in the bottom right-hand corner of Exhibit 86, which you have indicated with the black felt pen, is in fact the area which is depicted on Exhibit 85 which is the stand now?

DR. OSBORN: A. That is correct. So to come back to the question of what are the outputs from the forest resource inventory, we have three.

We have been through the aerial photograph, which is another example, we have been through the two forest map sheets. The third major output of the forest resource inventory is a documentation of the descriptions on the forest stand map sheet. The forest stand map sheet has descriptions on it, and we will come to those in much more detail later.

All of the data relating to describing these parts of the forest are compiled and they are put out in a set of reports. So we have the descriptions as a set of reports - I will speak more about those in a moment - and a set of stand listings. I will speak to the second of those two first, the stand listings.

The stand listings, as the name would imply, is a stand-by-stand-by-stand list of

descriptions. A stand with a block of trees or an area of the forest that was relatively homogeneous when compared with its neighbours. A block of spruce as distinct from a barren and scattered area, as distinct from a piece of muskeg. We will come to exactly how this is done later on, but this stand listing is a list of stand-by-stand and it happens to exist this day in age in a computerized format, so it is in some digital format.

So if I give you the FRI for your unit today, I give you the hard copy photograph, I give you the hard copy map sheet, and I give you your complete stand description in a computer readable format, so that you could do something with it.

I will also provide, however, both that stand listing in hard copy and in certain summaries.

Q. Are you looking for the report?

A. Yes. On pages 183 and 184 are two examples of a couple of pages and of what would be typically three or four hundred pages from a unit like Red Lake. We will come back to these documents in more detail when we talk about the detailed stand description.

At this point in time, this is an example of what the computer printout currently in Ontario

looks like in describing the stand-by-stand-by-stand listing. This form and format we will come back to at another point in time.

The example on page 183 to 184 is of the format that was produced when these data were produced which is back in 1983-84. That format has slightly changed, and so if you pick up a report today, in today's format, the appearance of that report has a slight modification. There has been some reaction from users to try and present the data in a more useable form.

Today's reports are slightly different in appearance and format from that given in 183, 184. In addition to this detailed listing stand-by-stand-by stand-by-stand there are, at this point in time, three additional reports which vary unimaginatively are called Reports 1, 2, 3.

I have not provided examples of these at this point in time. They are essentially summaries of these detailed stand listings. The way the data are summarized is a matter of convenience for the user. The form and format of the summary can vary and change depending who the user is. So giving you an example of what today's current computer printout looks like, I don't think is as important as you knowing that we have

the detailed data and in this day and age we can obviously reassemble it in whatever shape or format the user wants.

So to that end, knowing the report exists and knowing that the report starts with the basic stand descriptions of all the data, you can aggregate in whatever shape or format is appropriate.

The Report 4, details given on page 183 and 184, is complicated enough without elaborating on all the others which is a summary.

So three main products: photograph, map sheets, reports are the answer to the question of what is in the FRI in terms of output.

Q. Now, the photograph which was provided, Exhibit No. 84, which is referred to on page 179 is referred to and described as an interpretive aerial photo showing plot locations and plot descriptions.

Am I correct that this particular output -- you have got a description on the aerial photograph, Exhibit No. 84, you have some pencil marks and descriptions of the stands?

A. Yes.

Q. Those particular notations are made by whom and when?

A. The forest resource inventory production process is a three-year cycle from start to finish on any area.

Q. Perhaps you can then describe that three-step process leading up to the outputs then that you described?

And I understand, Dr. Osborn, that the description of this three-year process is set out in the witness statement at paragraphs 40 to 42 -- actually 44, I am sorry.

A. The three-step process. In the first year, which is the first step, the aerial photography is taken for one or more management units.

In the second year, after the aerial photography is taken and has been indexed and checked, the area is looked at by a set of people who are photointerpreters. They will plan where they will go and look and measure trees on the ground in the form of ground cruising for the FRI.

Q. Just so it doesn't become a matter of confusion later, when you say ground cruising in the second year, I understand that that is something different than what we will discuss later which is called operational cruising or OPC; am I correct?

A. Correct. In the second year, the

team of people will plan where they will go and put plots on the ground, where they will go on the ground and measure groups of trees.

In the course of the second year, in conjunction with field staff, they will do literally what I have just described, they will go out into the management unit, into the areas selected, and they will measure certain of the trees, a very detailed procedure to measure sets of trees.

Those data are described on a set of tally sheets in the field and, in turn, the photographs, like the example you have been given, are marked showing the location of the particular plot. So literally the photointerpretation and ground cruising staff will go out with the photographs, they will locate on the ground where the tree plant plot was to be, given they find it and they find it is what they thought it was in terms of the planning process, they will then measure the trees in a set procedure, they will dutifully record what they find, what they have measured, they will prick on the photograph and mark on the photograph the location of where the plot was.

On the photograph you have been given, if you look at the photograph and on the photograph on the highway which is the white line on the photograph with

a sharp right-angled bend in it - and that highway is at the northeastern corner of the photograph in terms of orientation - just to the left-hand side underneath the bend you will find a black line drawn on the photograph. Black line indicating an actual sample was put in that location on the ground, the black line representing a forest resource inventory ground sample plot. And the location of that plot is not only shown on the photograph, it is also shown on the forest stand map.

Q. Perhaps you could, by referring to document...

A. 181, on page 181.

Q. Exhibit 84 -- pardon me, look at page 181 and can you identify what this line is that you are referring to?

I see there is a line in -- right at the bend of that highway and there is a number 102 right below where that bend is.

A. All right. On the Document 181 right at the bend on the highway, right under the bend there is the number 102, and immediately in the book below that 102 there is a line, a solid black line, and in fact below that line again and to the west side of that there is another solid black line.

Q. There are lots of lines here. I am not too sure whether the Board knows what line you are referring to. Do you have an overhead?

A. Not of the photograph because it is very hard to produce the aerial photorgaph as an overhead.

MR. MARTEL: Is that where the No. 99 is?

MR. FREIDIN: I am just wondering whether -- either by just holding up your book and showing them where it is, so they know what bar or line you are referring to.

I notice the orientation of the photograph in the document at page 181 is a little different.

A. Might not be exactly the same.

Q. But I think we better not proceed until they know what this line is.

A. All right. On page 181.

Q. Why don't you just take it right up there and show the Board.

A. On page 181, at the bend in the road, we have 102 that was alluded to, there is a solid line and another solid line, as there is another solid line here, another solid line here.

These solid lines are echoed, shown on

the photograph. We have a solid line, we have a solid line that is in the bend in the highway. That solid line is that solid line.

So we have the sample plots that were actually taken in the ground, we have another one north of the road. Correct, yes. And then another one that is in the corner and hard to see in the photograph. It is hard to see, but the two you have highlighted indicate where we have on-the-ground samples, marked on the photograph, pinpricked on the back of the photograph, and also ending up being marked on the map sheet.

Q. Dr. Osborn, could you just tell me which stands have been marked as having a line indicating the sample plots?

A. Stand 103 and stand 111.

THE CHAIRMAN: Mr. Freidin, perhaps Dr. Osborn should be pointing these two things out to the counsel present as well, they do not know.

MR. FREIDIN: That's right, I was just going to suggest that.

If I might -- all right, I won't lead the evidence.

Q. Dr. Osborn, could you describe --

THE CHAIRMAN: Dr. Osborn, I think the

easiest thing to do, there is not many counsel present, would you just go to each of the tables and just very quickly point out...

MR. FREIDIN: Why don't all counsel go to one table.

THE CHAIRMAN: Or all counsel to one table.

---Discussion off the record

MR. FREIDIN: Mr. Chairman, I am trying to have the witness give an overview of this information or the procedure whereby the inventory is prepared.

I intend to go back with the witness and deal with this in more detail so that you will actually be able to read one of these stand maps and understand the significance of the information and all the little letters that are contained in those various stands.

Q. So I think, Dr. Osborn, you were indicating that the second step then of this three-part step was the ground or field sampling which resulted in a document like Exhibit No. 84 which is the interpretative aerial photograph.

DR. OSBORN: A. Yes, we have gone through the first half of that. In the second year, the crews will go out and measure on the ground in the

course of the summer these particular plots and record the trees, mark on the photograph and bring back the data describing those plots and those photographs back into the office.

That is the second half -- sorry, it is the first half of the second year. We have done the photograph -- the ground cruising part, they bring the data back into the office and they will then do the photointerpretation part in the course of the second year. The photointerpretation part is what gives rise to the stand boundaries on the entire set of photographs.

Q. Now, you say there is a three-step process. I am going to take you back to one and two, but what is the third step?

A. The third year, the third step, those interpreted photographs and the associated data with the description written on those photographs are transferred from the photograph on to the planimetric maps I referred to earlier. The planimetric maps showing the drainage, the roads, the underlying planimetry of the area. That map is used as the basis on which to transfer on top of that map the forest stand dematic data, where the forest stand boundaries are and the descriptions associated with those forest

stands.

So the third step is the third process, the third year is the transfer of those interpreted photographic boundaries on to planimetric map to create a forest stand map complete with all the descriptions and the descriptions, in turn, are entered into a database to provide the detailed stand listing we referred to earlier.

And the last part of the third process is the production of the forest stand map in a final drafted form as well as the production of the stand listing and the summary reports.

MR. FREIDIN: Mr. Chairman, I am just wondering whether you were planning to have a break this morning. If you were, this would be a convenient time.

THE CHAIRMAN: Okay. Let's break for 20 minutes. We will return at 12:00.

Thank you.

---Recess at 11:40 a.m.

---Upon resuming at 12:00 p.m.

THE CHAIRMAN: Be seated, please.

MR. FREIDIN: Mr. Chairman, perhaps I could just give a brief indication of where we are going and how far I think we are going to get today.

I intend to go back to the three-year process that Dr. Osborn has described and ask him some further questions to provide a little bit more detail as to what is involved in each of the three years during which the forest resources inventory is prepared.

I think when I get to the third stage, the production of the maps and the reports, what I intend to do is to have Dr. Osborn in fact deal with Exhibit 84 and page 181 and deal with that particular stand map or that portion of the stand map in enough detail so that at the end of that the Board will understand how -- can pick up any stand map and read it and know what information is being provided.

I think that will probably take us until two o'clock. So I won't tell you what is coming after that.

THE CHAIRMAN: Keep it a surprise.

MR. FREIDIN: Well, I could go on, but I will do it in segments.

THE CHAIRMAN: Very well.

MR. FREIDIN: Q. Before I go back to year one, Dr. Osborn, you referred in your evidence to various scales, 1:15,840 and 1:50,000. Could you give the Board some sense of what those different scales

are?

DR. OSBORN: A. Yes. The 1:50,000 or the 1:63,360 typically the scale for the -- for Exhibit 86, typically that scale is 1:50,000, 1:63,360, the composite map is an inch to a mile. 63,360 is an inch to a mile, 50,000 is slightly larger than that, its quasi-metric equivalent. So that scale is approximately an inch to a mile.

I talked of the forest stand map example which is Exhibit 85 as being 1:15,840, as was the photograph. 1:15,840 is approximately four -- one inch equals a quarter of a mile, 20 chains to the inch. So that is a larger scale than the 1:63,360. They are -- and the 1:20,000, again, we are talking approximately the same as the 1:15,840.

So we are dealing with two prime, two main scales, a 20 chains to an inch type scale, and an inch to the mile type scale. These are typical scales used in forest management in most of the world.

Q. All right. Dr. Osborn, if we could go back to the three steps of producing the forest resources inventory. You indicated that in year one, and this is referred to in paragraph 40 of the witness statement, that the management unit is photographed from the air.

And you have, I understand, an example of an aerial photograph that would be taken, would be Exhibit 84 without the markings on it; is that correct?

A. That is correct.

Q. Who takes those photographs?

A. The aerial photographs in Ontario, and have been for some time, are taken under a contract. So a contractor is tendered for and contracted out to commercially fly for us and take those photographs. A tender has some rather detailed specifications, the area of coverage, the time it's permissible, the kinds of photography that's required, the scale required, and that is all done under private contract.

Q. And when does the aerial photography take place in terms of the time of the year?

A. Because the photographs are used to ascertain what kinds of trees are there, the photography needs to take place when at least those trees that drop their leaves in the winter have got leaves on. So it's taken as soon as the leaves flush out in the year which typically is the end of May, the beginning of June, depending a little bit which part of the province you are in.

So aerial photography contracts cannot

start until the leaves are flushed out, typically the beginning of June.

The photography requires to be taken with a minimum amount of haze because that makes photointerpretation very difficult and also with a minimum amount of shadows which cause difficulty in seeing the photograph.

Now, for those two reasons, the haze situation progressively gets worse throughout the course of the summer and the shadow situation becomes more and more acute the later into the fall. And the obvious ultimate comment is some time in the fall inciduous trees at least will drop their leaves.

So the end of the aerial photograph contract period is a sort of moveable beast. We like to do it as quickly as possible from the beginning of June, typically a contract will finish any time from mid-August to the beginning of October.

Now, it will take that length of time in some instances for a variety of circumstances. We will not let - and in fact the aerial photograph contract people will not fly under certain weather conditions. If there is too much haze and/or the weather is sufficiently overcast they will not fly, written in the contract. So the actual number of days when conditions

are suitable to obtain photographs adequate to the spec is limited.

And, in fact, we will have dialogue with the local Ministry district staff watching and keeping track on the local weather conditions and responding to us daily as the contract progresses that we have a local estimate of what the weather conditions are.

So in the course of the summer we like to try and get it completed as soon as practical, for a variety of reasons: be they haze, weather conditions, that often gets extended to quite late in the year.

Q. Now, would you go then to the year two, which is referred to in paragraph 41 of the witness statement, and we are now talking of the field or ground sampling that you referred to.

You indicated that on Exhibit 84 and page 181 of the witness statement the areas where ground samples were in fact taken by the notation of a bar, putting a bar or a line on certain stands.

Could you advise on what basis or criteria are the decisions made as to which stands or which areas are actually going to be the subject matter of a sample plot?

A. The photointerpreter, and usually one photointerpreter is assigned to a management unit, and

there are reasons for this we will explain in a moment. The photointerpreter who has that unit as his or her responsibility will look at the aerial photographs for that unit as soon as they come in, will look at the previous forest resource inventory and will have an appreciation of: What kind of forest am I going to do the photointerpretation upon.

Is it hardwoods, is it softwoods? Is it in the boreal, is it in the St. Lawrence type of forest type? Is it particularly old, is it young?

Now, all those factors the photointerpreter will take into account because he or she is trying to come up with some feeling for the range of conditions within that unit to put in samples that are representative of those ranges of conditions.

Q. How does the photointerpreter make that assessment as to whether certain areas are representative or not?

A. Okay. Bear with me, we are still looking at the unit as a whole, trying to get a feel for the unit as a whole, and trying to work out: Am I predominantly softwoods, predominantly hardwoods, because we are looking for a subjectively placed sample that represents in the eyes or the mind of the photointerpreter a representation, representation in

kind of species, representation in stocking, density, crowniness of the trees, ages of the trees.

So we are looking for a coverage that approximates one plot per square mile or less, that covers the ranges of conditions typically found in the unit, paying attention to those parts of the unit particularly that appear to be difficult to interpret.

As an example, pure stands of jack pine, pure stands of spruce, all the trees are jack pine, all the trees are spruce, are relatively easy to distinguish on a photograph and interpret exactly what you are seeing.

Stands that are a mixture of species, a mixture of sizes, heights, a mixture of ages inherently are more difficult to interpret and, therefore, on those areas more attention may get paid or more plots put in. In addition, there is typically more effort placed in putting plots in those areas that are close to maturity than in the 10, 20, 30-year-olds.

Now, all of that goes through the mind of the photointerpreter in conjunction with whatever other evidence that he or she has solicited or obtained from local field staff. The local field foresters and/or company foresters are approached right at the beginning of the three-year cycle before the photography takes

place, reminded the inventory is going to take place on this area, they are asked to provide field information that is described, previous surveys, previous assessments.

Mrs. Koven asked yesterday about the difficulty with barren and scattered and very young trees. The field typically will provide recent surveys of young stands that are very hard to see on the photograph. Those additional data, local data, are solicited from the field as an aid to that photointerpretation process.

So if we can obtain local knowledge, best estimate according to the field forester, we would incorporate that and that in turn may change or reduce the amount of ground sampling that is done through the photointerpretation process.

THE CHAIRMAN: Dr. Osborn, I am not clear on who the interpreter is. Is he a unit forester, is he an independent person that is hired outside the Ministry? What kind of knowledge does he have about the management unit on which he is doing the interpretation?

DR. OSBORN: Within the section I look after in main office I have on staff six photointerpreters. They represent the core of people

within the government responsible for photointerpretation. They spend their entire summer doing the ground cruising on the unit they are assigned to.

So they work out of main office, they spend the summer working on the unit on which they are going to do photointerpretation, often with either local district staff in the Ministry and/or company staff.

Now, in addition to that, we have in some instances company staff indirectly involved in doing the photointerpretation, but checked and verified by the six-man team I described that MNR has at main office.

To pursue your question, there are private contractors who we may contract, either with the Crown and/or the forest industry may contract to do the photointerpretation on that unit. So there is a range of circumstances and they vary from unit to unit. The point to stress is the person who does the photointerpretation is the person who does the ground cruising.

You asked a question about skills and experience and background. The Ministry typically has hired - in fact, I have just hired three new

photointerpreters - we are looking for people who have done this before with expertise who can see stereoscopically, who in fact go through a test using the Crown's procedures of photointerpretation to check these people in fact can do what it is we are looking for.

Typically, we do not employ and we do not use very many local MNR field staff to do the photointerpretation. And so in answer to an ensuing question about why - which might seem rather obvious - we have tried this, in fact in the days of the 50s and 60s, considerable time and effort was spent with photointerpretation done by local staff.

For the most part that was unsuccessful for two main reasons. The first is not everybody can see stereoscopically, so literally people cannot see on the photograph the heights of the trees, they won't jump up and hit you, so to speak. The second is not everybody has the skill to photointerpret and distinguish between the species.

We have found it's a rather specialized skill and, in fact, some early criticisms of the forest resource inventory described this at some length and the result of that is we have gone to a specialized set of people carefully trained, maintain, build up the

expertise and retained for this particular function.

MR. FREIDIN: Q. And you say some people cannot see stereoscopically. Can you give the Board some idea of what you mean by that term and what somebody who can see stereoscopically can actually see when they look at an aerial photograph?

DR. OSBORN: A. I suppose the easiest way of translation is they can't see in three dimensions. They can't see in 3D.

In terms of what does that mean on the aerial photograph, on the photograph we are not only looking as literally two dimensions, what can you see in terms of coverage, long ways and broad ways, as far as regards the shape of the trees and the height of the trees is an ingredient that we will photointerpret, the orientation of the land as it affects the kinds of trees.

So the topography, the contours and the heights of the trees, and the shape of the crowns, all of which are a three-dimensional feature, all of those necessitate somebody seeing in three dimensions. Somebody who cannot see stereoscopically will just see a flat aerial photograph; there is no third dimension to it.

A person who sees in 3D with the aid of a

stereoscope can literally see - and when I said the forest will jump up and hit you - when you see in 3D, you look at aerial photographs in stereo, you can see that third dimension. The topography is literally will roll in front of you and the tree heights will be represented.

Q. And during the -- going back then to the ground sampling, could you just list for the Board the type of information that is attained and determined through ground sampling?

A. In the ground sample, as I mentioned before, it s planned, the actual location of the plots are marked on the photograph, and the cruise party will go out, it will find a plot -- sorry, a spot on the photograph that is observable on the photograph and on the ground.

So they would travel by road or by boat to a location on the photograph that they can find on the ground and on the photograph, what would be technically called a tie point. I will come back to why in a moment.

From the tie point they will take map and compass or photograph and compass and they would pre-plot, what compass area do I take and how far do I walk to the stop of my plot.

They follow this through the bush and at intervals they will flag with bright orange ribbon usually, bright orange ribbon will be put on the tie point - this sort of material, plastic ribbon - on the tie point to start with and at intervals into the start of the plot.

Now, the FRI sample plot in Ontario is made up of 10 separate observation stations. At the first -- and the stations are what was to chains, what is now 10 metres in the metric sense apart. At each of these stations, the centre point of the plot is marked, again, a piece of red or orange flagging is left at the beginning and at the first of these ten stations as the centre point of the plot.

And then from that plot centred they will in fact in a 360-degree sweep count and record the species of the numbers of trees in the plot, and at each of the 10 stations - they are 10 metres apart - they will repeat this 360-degree sweep of the forest and a count and recording of the numbers of trees. The unknown at this point in time is what is in the plot.

Since the early 1950s, Ontario has used a piece of technology that came out in 1948 in Austria of using a piece of technology that in essence is a prism - and I will bring this to your attention and

show you in just a moment - it is a prism, a device that let's you look at and assess what trees are to be tallied and what trees are to be not tallied.

Now, the prism - and I will demonstrate this in just a moment - will literally let you establish which trees, depending on their size, diameter - and I will describe that in a moment - and their distance from the centre of the plot.

If you step aside for a moment what we could have done from each plot centre is measured out a five-metre radius and somebody gone round and established a boundary line of a plot with an exact five-metre radius all the way around, a little fence around our five-metre radius plots. The old way of doing it, very time consuming.

This particular device let's us do that sort of thing without establishing the boundary.

Q. The device you are referring to being a prism?

A. The device being a prism, and I would like to bring this to your attention and demonstrate literally what am I looking at and how do I determine which trees I count.

The prism, as you can see, is a tapered piece of plastic. If you look through the prism - and,

Mr. Chairman, I will give this to you in a moment - if you look through the prism at the pillar in the far corner of the room, through it and over it, okay. The pillar both over and through it will be displaced.

They have made it so that -- let me see.

MRS. KOVEN: Is that stereoscopic?

DR. OSBORN: You don't need that for this particular piece of the story, okay.

Now, we have got a displacement so the top of the pillar and the part through the prism have got a displacement. If those pieces actually are completely displaced and they do not overlap at all we would not count the pillar.

MRS. KOVEN: Because of its diameter?

DR. OSBORN: Because of its size, diameter in this case, and the distance according to the strength or the angle of the prism.

So there is a relationship between the angle of the prism, the distance to the object and the size of the object.

If we look at the pillar that's closest to us, you will find that the pillar will overlap.

THE CHAIRMAN: Right.

DR. OSBORN: All right. And that we would count in the plot. So the fuction of size of the

tree, diameter, the distance from the plot centre and the strength of the prism - and I don't want to elaborate on the theory of that right now because I can't remember it - will let us determine which trees are in and which trees are out.

THE CHAIRMAN: So are these calibrated to a certain distance?

DR. OSBORN: Yes, sir, there is a table for each prism that will tell you for that angle of prism which trees would be in, which trees would be out.

MRS. KOVEN: Is it 10 metres?

DR. OSBORN: Ten metres now doesn't come into account. Instead of making a 10-metre plot fixed radius, I now don't need to make that fence, this will let me determine which trees do I look at, which trees do I not.

I could have a very little tree close to you but because of its size it would not be in. A very large tree, very far away which, because of its size, would be in the plot. So the plot now is a different concept, it is called plotless cruising, because there is no real plot, but this device is therefore very rapid, you can stand in the plot centre and turn this around the plot centre and very quickly the interpreter

will go: Jack pipe, spruce, it can see literally which is in, which is out, straight count.

Because of the theory of the device, the count in turn will end up estimating what is called basal area, the cross-sectional area of each of the trees that are in. If we were to cut each tree -- and we observe each tree at what is called breast height in forestry, 4.6 feet above the ground. So we observe the tree at breast height.

If we were to cut the tree down at that height, the cross-sectional area is called basal area. The prism in the way it works will count the number of trees and the strength of the prism, in this case is two, will let us estimate basal area.

More importantly is the device let's us quickly estimate and count which trees are in, which trees are out.

MRS. KOVEN: So what's its range?

DR. OSBORN: A fuction of the size of the tree. If I got a very big, four or five-feet diameter tree, it could be the other side of the street; if I am a little four-inch tree right here I may not be in the plot at all.

MRS. KOVEN: But it doesn't exceed a hundred metres or 50 metres?

DR. OSBORN: Now, I have got to really think because with some very large trees it may, with respect to the prism, exceed 50 -- no, that would be really pushing it, that's all.

It raises a practical problem trying to see a tree 50 metres through dense bush is quite a practical problem. The device is not without its limitations. The point being made is that this device is what is used at each and every one of the 10 stations to count and record the number of trees by species.

THE CHAIRMAN: I do not know if you want to. If any counsel want to look through that prism, maybe Dr. Osborn will let you have a go at it.

MR. CASTRILLI: Perhaps at the break, Mr. Chairman.

THE CHAIRMAN: Very well.

DR. OSBORN: So at station No. 1, establish the plot centre, the two-man crew, the cruiser will sweep with the prism a 360-degree turn about the plot centre, not about his own body because that will cause an error, we have to train the staff, the prism turns on the plot centre.

Again, the prism has other pieces of how to use it. If you are on a very sleep slope, you

adjust the prism by the angle of the slope. There is a whole host of mechanics of making sure you know how to use this tool.

At plot No. 1, you can't have any trees by species. At plot No. 2, you actually will do the same and, in addition, by station No. 2 you will have had a look, as you have gone from Station 1 to Station 2, what are the predominant trees in the stand I am in; is it mostly spruce, is it mostly poplar, is it mostly maple? Because by station No. 2 I would like to take a measurement of the height and the age of the predominant species.

So as I walk through the bush between my stations, I am not only measuring and following a compass course, I am also paying attention to what am I looking at in the stand, what is it made up, its composition, I am also looking at what the site is, the vegetation underneath might be, and by the second station I have got maybe some some feeling for the predominant tree in the stand.

Without elaborating, the predominant tree in the stand is going to be called the working group species. Stands are classified, as we will see later, into working groups for management purposes, and it is that working group species which is usually the

predominant species in the stand that I would make additional measurements on.

So station No. 2, I do my count. I also select a tree, a tree that is typical of the stand. Now, in forestry jargon I am picking what is called a dominant and co-dominant, a tree that has its crown up in the canopy, close but necessarily over the top of the other trees, and the tree whose diameter is not in excess of the large tree, but is typically an average tree but is not quite underneath the canopy. So I am picking a tree that I feel is representative.

MR. FREIDIN: Q. And the canopy refers to what?

DR. OSBORN: A. It is a technical word describing where the leaves are, where the upper branches and the leaves are in the trees typically is up in the upper levels and the collective term for that part three-dimension of the forest is the canopy.

So I am picking a tree that appears to be typical and on that working group species, having selected a tree, I will measure its age and I will measure its height.

I measure its age by literally taking a device that looks -- that is called an increment borer, it is like a corkscrew with the exception that it is

hollow, and I will bore into the tree, usually about a foot above the ground for reasons, because the extreme base of the tree is very hard to get into practically to turn this around; and, secondly, the very base of the tree often is flared and may or may not be rotten.

So I will bore into the tree usually, practically about a foot above the ground. I will bore this device like a corkscrew into the tree, trying and hoping that I hit the middle.

Having got the borer into the tree, we literally unravel it one turn to break that core off and then we slide a grooved spill into the borer and the grooved spill would, in essence, lift that core that is now in the body of the borer, and I will withdraw the spill with the core and, as I say, hoping that I hit the middle of the tree which is youngest, I will then count rings.

The trees lay down their growth as a series, cross-section of rings, the youngest being at the middle and working outwards is the way trees grow. And so I can estimate the age of that particular tree by carefully counting the rings on the increment borer. It behooves me to make sure I do hit the middle otherwise I have got to either rebore or make some estimates.

I also take the borer a foot above the ground, depending upon the species, I will make allowance for how long it took the tree to grow to a foot in height. The allowance varies with the species. It might be four years for a conifer, it might be two years or three years for a poplar tree.

So I realize I am not at ground level, it is not the total age of the tree, I will make an estimate of what needs to be added and I will in fact record and tally the total age of that particular tree. So I use this device in my plots, called an increment borer, to estimate the age of my typical tree of the working group species.

The tree that I have bored into and estimated the age, while one of the cruisers is doing that in a two-man team, the second man is measuring the height of that tree. There is a variety of height-measuring devices.

I have got in my hand an example of one of them that is used typically in the FRI. It is called a Seunto clinometer - Seunto is the name of the company who manufactures it, clinometer is a name for a device that measures angles. So this device can also be used for measuring slopes of ground as well as measuring heights of trees. We happen to use this

device or one or two other height-measuring devices.

In measuring the height, we are really the measuring up and down from the point -- we have gone through some elementary geometry to estimate the height of the tree. We have another device taken into the bush which is used for measuring the height of that tree for which we have taken the age.

We go on to station No. 3, we count the number of trees...

Q. Can I just stop you there. When you measure that height, is that height measurement also taken then on the tree which is typical of the working group species?

A. Yes, it is this tree that was selected that is typical of the working group species we measured for age, it is the same tree we measure for height. This was on station 2 usually.

And just as an adjunct to that, we are measuring the total height of the tree; that is, from the ground level to the tip, total height of the tree and, in some cases, particularly with the hardwood, the deciduous hardwood trees, oak, beech, maple, the top of the tree is not the easiest thing to see, so there is some practicality estimates and difficulties even in the measurements in the field.

One, not an aside comment, but a practical difficulty associated with this process that in fact we bumped into last week in the Algonquin region, measuring. We measure and tally living trees, we do not record or make a tally of dead trees. So when we do this sweep with the prism, we are tallying live trees.

Now, this year the defoliation that has taking place in the hardwoods in the Algonquin region has been very severe and literally last week out in Dorset when we were tallying, trying to ascertain where the tree has no leaves on it whether it is alive or dead is a bit of a problem, and all the oaks have been completely naturally defoliated.

So here you are peering up 60, 70 feet above the ground trying to see whether the buds are alive or not. A few practical errors even in what seems obvious like counting trees.

Station 3, count the trees; station 4, count the tree; station 5, count the trees. All the time tallying, recording, making sure that the working group species we started with in station 2 isn't changing and, if it is, we may have to change our minds as to what the working group species is, forget what we measured on station 2, because we need three estimates:

the working group species, age and heights.

Station 6, tally the trees, measure and age and height working group species. Same set of procedures.

Q. In reference to needing three samples of the working group, in other words, does that mean you, in those ten plots, measure what you have identified as the working group finally at at least three of those stations?

A. Correct. We want three trees, three estimates of age and height in the working group species on that entire plot of 10 stations. So if we find halfway down the plot the working group or the type of trees have changed dramatically, we have to rethink and remeasure.

So we go down this line of 10 plots and on the tenth one again we take the final measurement of the number of trees and we estimate age and height an working group species.

So a FRI stand plot or a ground plot is made up of 10 stations, tallying the tree by species in such a way that it records their basal area, because of the way the prism works, measure the ages and heights of three typical working group species trees.

Now, I will bring to your attention to

page 164 of the evidence. On page 164 is a copy of the field tally sheet, recording sheet, used at this point in time by the FRI.

Q. Perhaps, Dr. Osborn, you could just briefly describe the document of which this particular page is a part?

A. All right. This particular page is part of--

Q. It starts at page 146.

A. --of 147. This is a publication entitled, given on page 147, is the forest inventory procedure for Ontario. This is a booklet which is photocopied from 147 to page 178 that essentially describes the forest resource inventory procedures in Ontario including some details that I have just gone through in terms of actual cruise procedures.

On page 164 is an example in that booklet of what the tally sheet typically looks like.

On page 164 there is a piece of the evidence that's headed: Back - back of the page - and on that part of page 164, the top line under Back reads: Flight No. 4396 - aerial photography flight number - when the aerial photography is taken there is a series of east, west, flight lines. So to cover any area it is not just one sweep of the aircraft, the

aircraft goes to and fro in a series of flights. The actual flight number is recorded on the aerial photograph.

The next is the Photo Year, when was the photograph taken, because the cruise may not take place immediately the year afterwards, you have to be aware of that. It should do, but it isn't always the case. The roll number within the flight line. In the printing process, there may be more than one roll produced in printing in that flight line, and finally the Photo Number, all of which show up on the photographs.

So we have a tally on the sheet what photograph are we talking about, what do these data relate to. Then we identify who the guilty parties were out in the field taking these measurements. This, in a way, is useful because it helps go back and identify, where the inventory has proven to be a relatively good representation of what has been found, you start to build up some credibility with who did that and how well did they do it.

So that the recording of who did it, in all honesty, does comes back to indicate what staff have skills in doing this sort of work. This build up of expertise in this subject of ground cruising and

photointerpretation is very important. You build up a credibility, what people can do this.

Again, on our back, we then have a tree count by species and you will see there are 10 stations, station No. 1 to 10 as described, and next to station number we have letters of Pj - reading across the page - Sb and Po. Pj is jack pine, Sb is black spruce, Po is poplar. And then for each of the stations there is a dot and box count of how many trees were recorded by the tally man as the cruiser swept with the prism.

Going from station 1 he found 3 jack pine, 2 black spruce and 2 poplar trees, a total of 7 trees in the sweep, and station 2 and station 3 likewise. So the actual recording in the sweep and the number of trees by species is recorded. And the tallying by species is summated in the total. So at the bottom of that station number there is a total: The jack pine, there was 25 trees, in the black spruce there were 9, and in the poplar there were 51.

That has given the cruising staff some clue as they have gone through what the working group species will be and they keep this tally, they keep this observation and, therefore, they know which trees, which species to select for age and height

measurements. This is the mechanics of literally the recording of these data in the FRI.

In addition, on that tally sheet there is some other information, for example, on the front page, we have again the forest district we are in, the management unit we are in, the township we are in - we talked about townships, there is the map - we have got a summation of the main stand species. There was three-tenths jack pine, and under Sb there is a one and under poplar there is six.

You will see later we will describe the stand in tenths by species. Even though the tree count is more detailed, it will get summarized into tenths by species. So 3 jack pine, 1 black spruce, 60 per cent poplar.

The one underneath that is the line I want to allude to where we have the age and the height values recorded, ending up with an average age and an average height. So the tally sheet, taken to the field, recorded in the field, actual measurements on those trees, put on to the tally sheet, the data from the tally sheet are summarized and written on to the back of the photograph where the pinprick is and where the plot was recorded so we have a record of where we have been and what we found on the ground.

Q. The age and height then that was recorded there, is that then for the working group species?

A. That is for the working group species.

Q. This particular example would be what species?

A. It would be poplar. With six-tenths of the species being poplar, that would end up being the working group species.

MR. MARTEL: Where did you put the pinpricks?

DR. OSBORN: In some part of the line on the photograph where the plot was located. I am not sure, Mr. Martel, exactly whether it is the beginning of the plot, the end of the plot, the middle of the plot. I personally don't do this often enough -- don't do this enough period to know exactly where the pinprick goes, but it is where the plot is.

MR. MARTEL: What is the purpose?

DR. OSBORN: Essentially to make sure on the photograph there is a record of I actually went to visit that plot. The photograph had marked on where the plots were to be, planning.

Now, for a variety of circumstances - I

may not get to all of them - the pinprick and the data on the back of the photograph is essentially confirmation I went where I said I was going to go, and there may be some plots planned that I didn't actual attend.

MR. FREIDIN: Q. And the location of plot, when you look at the final product on page 181 where you have got that line indicating that a plot was taken in that particular stand, is that line supposed to indicate sort of exactly where the plot was taken or just indicate that a plot was taken in that stand?

DR. OSBORN: A. A little bit of both. Certainly the last certainly indicates the plot was taken in that stand. The orientation of the plot, with some effort we will try orient it with regards to the stand, but it may or may not be an exact translation in terms of location.

Remember, however, that this plot is marked on the ground and the reason for marking -- why do we mark the tally point, why do we mark the work when we went in, why do we mark the centre line of the plot. An earlier question, Mr. Chairman, you asked was: Who did this.

Whoever does it, there is a check cruise. For a certain percentage of these ground plots - five,

10 per cent, it will vary, depending on who did it and their expertise - we will go back with a check cruise plot, find the initial tie in point, walk in following the compass bearing to where the plot is supposed to be and recruise exactly the same procedure down that sample plot, and that check cruise party will in essence compare what did they find versus what did the initial cruiser find.

And depending who is doing the initial cruising this can be rather key and rather crucial especially when we have got people employed doing this whose expertise might be limited for a brief period of time, and there is no doubt that sometimes that both contractual people and the Ministry have in fact employed junior staff to work as part of the two-man team.

And there is a need to check and verify: Are the parties doing what they are supposed to be do. And, in fact, if in fact we find there are errors being made we will not accept plot data and we will cause there to be a recruising of some areas. It is inherently part of the contract if it is done on a contractual basis.

Q. Who goes out on the check cruise?

A. Primarily Ministry staff. I talked

back earlier of the six-man photointerpretation team of main office. It is those people who will be the leading party in any check cruise.

I should add that in any contract, any contract work, there is an obligation of the contractor to also check his own cruise parties.

Q. If I could just look at that tally sheet then, and ask you the question: What information is obtained or determined then on one of these cruises. You have indicated that you get the age and the height of the working group species, you get a description of the species composition that you referred to on that tally sheet in the second box?

A. Yes, on the item headed Front, the second main box under Front is a main stand species composition.

Q. And do you get information in relation to basal area on these samples -- on these field samples?

A. Yes. If you go to the part of page 164 labeled Back, and if we come down to the third box, you have a box describing the plot line, a box describing the tree count, we come to the third box on the back and that box starts with the word: Total trees(85), that total number of trees on the plot from

all 10 stations is multiplied in that equation by the basal area factor which is the 2, and that basal area factor is the strength of the prism.

When I was earlier describing the prism, I mentioned the angle of the prism could vary and each prism has its own basal area factor. Typically in Ontario we use a basal area factor of 2.

In this particular case that's what's given in the example. So the 85 is the number of trees on the plot was multiplied by the basal area factor and, in turn, that's divided by the total number of stations which were 10, ending up that number of 17.

I mentioned when I said about the prism, the prism is estimating the cross-sectional area of the tree, prism strength, the distance from the plot and the diameter of the tree, its size, are all inter-related, but it so happens the prism picks up trees proportional to their basal area.

So in that equation you can estimate the basal area by multiplying the number of trees times the factor of the prism and reducing it because of the ten plots. So we end up with the answer of 17, in this case, square metres per hectare. Square metres, cross-sectional areas of the trees on a per hectare basis. So there is an estimate of what is called in

forest mensurational terms basal area per hectare.

Q. And I note that there is also a reference in the same page on the front part of the tally sheet in the third box, two items which you will describe later in your evidence, of site class and stocking; is that correct?

A. That is correct.

Q. And you will be describing what those are when we go through the actual stand map, I understand?

A. Yes, and to make that link, site class will be derived from the height and age relationships that have been tallied, the stocking will be derived from the basal area values that have just been described.

Q. In paragraph 43 of the witness statement, you indicate that additional information or knowledge about the forest being inventoried often exists at the management unit level and that that information or knowledge may take the form of formal surveys, such as Free to Grow surveys, Not Satisfactorily Regenerated surveys and Operational Cruises or more commonly from personal knowledge of the forest manager or other MNR staff about the area in question.

What is the sort of personal knowledge of the forest manager that might be collected and be useful in terms of doing the cruising that has been referred to?

A. Apart from the list of items given in paragraph 43 on page 29, the local manager, company and/or Crown, will have information about the previous usefulness of the FRI how well has it served them in the past, what were areas of concern, what were areas that gave rise to difficulties, and can be both observed, recorded and passed back to field cruising party. where should they pay particular attention because in the past we had some difficulties.

Secondly, the local field party will have familiarity and knowledge in where are the operations for the next five, 10, 15 years likely to happen, areas where we may pay a little bit more attention than we would in the total area.

The third would be where it's realized that there is considerable local mixture of the forest, where the particular areas are complicated in terms of species composition and/or ages because, as we just described in trying to measure the working group species age and height, if we have stands or groups of trees where there is a complete add mixture of ages

and/or species, the determination of what the grouping group is and the selection of the average tree per age becomes a little bit complicated.

So where are we going to run into difficulties in the cruising and the photointerpretation from the local manager's point of view.

Q. And you indicated that the local knowledge may indicate the previous usefulness of the FRI. What do you mean by that?

A. The FRI provides an estimate for a particular unit, and in the course of time parts of that unit will be harvested and there will be a measurement and an awareness of what actually was realized, came from that particular areas that were harvested.

There will be some local knowledge, local comparisons whereby the user, particularly the forest industry in this case, will have some feeling that the FRI estimated there was 20 out there and in actuality I got 17 or I got 22. Depending on what sort of product they were looking for, there will be some understanding of why the difference.

Most forest companies, for example, in the province, if I was to go to and ask: What do you

know about the FRI in terms of what you get out of the forest in relation to the FRI, most companies will have a local knowledge of its overestimation or underestimation.

We mentioned earlier of one photointerpreter, one unit. Recognizing this is somewhat of a skill, we are trying to keep any bias that may exist with a photointerpreter a constant.

We have a variety of photointerpreters instead of one photointerpreter, some of them may overestimate height some of them may underestimate height. Having one person do it, that bias is a relative constant. And so industries tend to realize after a period of time if I have got a particular kind of unit, a particular kind of photointerpreter, I have found in general I have got an overestimate or an underestimate. Now, that sort of information is passed back to us, perhaps some awareness of that.

Q. Dr. Osborn, I understand that the Canadian Environmental Law Association asked an interrogatory in relation to field sampling and, in fact, asked what the criteria were -- what criteria are applied to determine what areas are subject to field sampling.

They also asked what percentage of the

forest land base is sampled.

An answer was provided and can you tell me, were you involved in the development of the answer to that question?

A. Yes, I primarily wrote it.

MR. FREIDIN: I am wondering, Mr. Chairman, if I could make that question and that answer an exhibit and ask the witness some questions about the answer which was provided?

THE CHAIRMAN: Very well. I believe we are up to Exhibit 87.

MR. FREIDIN: (handed)

---EXHIBIT NO. 87: Interrogatory posed by CELA and answer thereto written by Dr. Osborn.

MR. FREIDIN: Q. Do you have one of those?

DR. OSBORN: A. Not in front of me I don't, no. Thank you.

Q. In the answer provided to the question you indicate that accessibility is a criteria used when choosing the location of sample plots.

A. That's correct.

Q. And for what reason?

A. Two related reasons in a way. The first is practicality or pragmatism. The areas being

inventoried are relative -- the areas in the inventory are relatively large, the resources to cover inventory of those areas is relatively limited.

In terms of the wise use of that limited resources, we try and get as many plots as we possibly can with that limited number of resources. So to get as complete a coverage as we can, it really behooves us to deal and get at those areas that are most accessible.

Now, within this province the nature of the forest is that it is relatively inaccessible. So the second half of the story is in order to get the people in and out in a practical sense most of the sample plots are taken close to a road, as was evidenced by the example shown to you in the aerial photograph earlier today, and/or the plots will be close to water access.

This is a function of dollars and cents, trying to get a representative sample with a limited amount of resources.

Q. And in this particular answer you also indicate in the third full paragraph that the experienced photointerpreters consider, amongst other things, starting on the second line:

"...data specifically requested from

field foresters."

And have you described in your evidence the type of information that experienced photointerpreters will request of field foresters?

A. Okay. I am not quite aware where you are on the page, if you could explain exactly where you are on the document, please.

Q. I guess it is the fourth full paragraph under Answer, it begins:

"Experienced photointerpreters consider..."

A. Yes.

Q. And it indicates they consider, and if you go to the second line:

"...data specifically requested from field foresters."

My question was: Have you described the type of information which is requested of field foresters as you refer to it here?

A. We have made previous references, we will go to the field at the beginning of the three-year enterprise and we will sit down with them and ask for existing records of cutovers, fires, changed data, surveys on barren/scattered, surveys on regenerated areas, particularly young stands, we will ask for any

form of cruising where it has been done, we will ask for local knowledge of utilization, what have you got from the forest versus what the FRI have said.

All those kinds of data are asked and discussed. This is a two-way discussion. We explain to the field forester what we are trying to do and, in turn, we will request this information in either tabular or map format. And this discussion goes on in the beginning of year one before the photographs are taken, it is repeated and checked again in the beginning of year two in the beginning of this planning of where are the plots to go. And this discussion can be quite long and quite elaborate.

Q. Now, could you go to the next full paragraph and it indicates:

"Discussions with field foresters as to the accuracy of the past FRI may influence plot selection as certain strata may be difficult to photointerpret."

What do you mean by strata?

A. Earlier I described that we typically have difficulties where the mix of species and the mix of ages is very wide in its ranging, this range of ages, range of species. When that happens there is

some difficulties.

Now, when we put in representative samples, one of the first thing the photointerpreter does, as I mentioned, is try and get a feel for what the area is about. And what the photointerpreter is doing is mentally stratifying; that is, taking the entire unit and breaking it down into areas that are predominantly spruce, predominantly jack pine, predominantly poplar, mixed stands of spruce and poplar, young trees, old trees.

That classification, that breakdown of the forest into pieces in general is what is called stratification. A subdivision of the forest in order to help working -- which parts are representative to go look at. I want to go and find plots that are typically in mature jack pine, what plots that are in mixed spruce, poplar stand, they are examples of strata, subdivisions in the putting of the samples.

Q. Now, after the information is obtained through the ground sample, you indicated that the next output were the maps that you have referred to, the composite maps and the stand maps or they were the final document which is created.

A. I hope I didn't say that because you have jumped over the whole photointerpretation

enterprise.

Q. Right. I was going to ask you -- my next question was going to be: How does the photointerpreter use the ground sampling results to make judgments about the composition of all the stands within the management unit which are then shown on stand maps?

A. In this second year, in the course of the summer, typically again from sort of May/June 'til the fall, the ground cruising is done in the field. The photointerpreters - be they from main office, be they from the company, be they from the contractor -are out in the forest. Typically, that work gets completed by the fall, those photographs and the location and the plots marked and the descriptions marked are brought back into the office and they are then used for photointerpretation.

Now, a slight change happened recently in some places that I will mention which is being looked at as to a possible advantage, and I will mention it because it has some practical implications.

This past year we tried an experiment with one particular company in northern Ontario whereby the ground cruise parties who were also going to be the photointerpreters, the company and Crown worked

hand-in-hand in the field doing the cruising in the morning and the photointerpretation in the afternoon.

Now, there is a degree of practicality in that because you have got to check in the morning what I think I am looking at, in the afternoon you come back you identify in the photographs the actual stand boundaries. This was an experiment to see whether this would work.

The general reaction so far from the Crown - we didn't hear back from the company because we haven't got the final data put through - is it seems to be advantageous. The disadvantage logistically in having the photointerpreter now out away and in the field the whole time, wondering what he is going to do in the winter, because the normal event is the photointerpretation takes place in the winter months.

So normally at the end of the fall we will bring the interpreted photographs and the map data back into the office, which either might be the contractor's office, or the company's office, or the Crown's office and in the Crown situation it would be main office, and the photointerpreter will then go through map sheet by map sheet working out what photographs relate to the map sheet on the unit, he will take the pair of photographs - because the

photographs are flown such that there is an overlap.

When we fly the flight lines, as we go east to west in Ontario, the photographs are taken such that there is a 60 per cent overlap going east to west. It is not one photograph next to each other butting up, it is each and every photograph overlap each other by 60 per cent in an east/west flight line.

They also overlap each other by 25 per cent north and south. So there is no gaps. The more relevant is the east/west overlap. You then take the two photographs and you can place them under a stereoscope in such a way that you can see stereoscopically this photo pair.

So we have overlapping photographs to enable us to use them stereoscopically and that is exactly what the photointerpreter now does. He takes pairs of photographs, he puts them under a stereoscope - which is like a set of 3D binoculars - and on that photograph he is aware -- he or she is aware of where are the ground samples, what did the ground samples tell me.

I look at the photograph, I see where the plot was, I see what the trees look like on the photograph, I am looking at texture, I am looking at grain, I am looking at shape. I look at those things

and I can identify this is jack pine, that is what the photograph looks like.

The plot tells me it is predominantly jack pine, the plot tells me the trees were 60 years old and they were 20 metres high. So I have got from where the plot was a picture in my mind of the photograph and what the ground data were.

Now, that relationship is stored in the photointerpreter's head, that is where their skill comes in. The photointerpreter then will look at an adjacent block of trees where there is no ground sample and will see that they are similar to where we just had a ground plot.

That translation of the ground in the photo where the ground plot existed is moved to the areas of the photo where there was no ground plot and, by extrapolation, what looks like jack pine and was found to be 60 feet tall, 20 metres tall, is now identified on a part of the photograph where there was no ground sample.

In that process the photointerpreter is drawing lines on the photograph, lines marked on the copy of the photograph you have, lines demarcating what I called stand boundaries. On one side of the stand boundary the trees were predominantly jack pine and on

the other side of the stand boundary the trees were predominantly spruce, on the other side of the stand boundary the area may have been barren and scattered. So there is criteria for what constitutes a stand.

The photointerpreter is aware of this, he looks at the photograph and decides where the stand boundary lines will go, such that the area within the stand is relatively homogeneous, relatively the same mix of species, same predominant species, same age, height and other forest mensurational statistics.

So the photointerpreter is taking that relationship between the ground in the photo actually observed and translating that relationship to describe other parts of the photo where he didn't step foot on the ground.

Q. So if we just looked at -- just quickly we look at page 181 of the document, right at the right angle in the road, there is 102 which I understand is a stand number; is that correct?

A. Yes.

Q. And further up the road to your left there is a figure 103, which I understand is stand No. 103; right?

A. Yes.

Q. And then perhaps you would just

indicate then where the outline -- where the stands would be as you look at that particular document?

A. All right. To lead into this, let's come back to what is Exhibit 85, the forest stand map. This is an overhead that echoes what is in Exhibit 85 which was the forest stand map on the 15,840. That same map sheet shows in the overhead and in the overhead we have indicated in the top right-hand corner a particular piece of that forest stand map. That is shown as the document on page 181 of the evidence.

On this document on page 185 (sic) we have actually highlighted or coloured the boundary of an area which is a forest stand right at the bend of the road which is labeled 102.

Q. This is actually page 181 of the witness statement.

A. Sorry, did I misread?

Q. You said 185.

A. So right on the boundary, right on the corner of the road we have identified the boundary of stand 102.

Now, the photointerpreter didn't have this boudary on the photograph when he started off with, all he has got is a blank set of stereo paired photographs. The photointerpreter has decided that on

this right-hand side, right next to a piece of land that on the photograph is absolutely bare, is unclassified and typically is absolutely bare land, and if I look at the photograph I probably would have recognized this as bare land though I am no photointerpreter.

Q. You are indicating that the initials...

A. UCL are FRI shorthand for unclassified land, a piece of classification FRI we will come to later.

So the boundary between here, no trees and trees, is fairly easy to define. As we go around that particular boundary, we will bump up against other blocks of trees that are somewhat different from what I see in 102. So as I am looking at the photograph, I am literally going around with a pencil and identifying where do I think, as I look at the photograph, the difference between what I see in here typically and what I see down here.

If we move right away round to the stand adjacent, which is labeled No. 101, by this time I have come around to a group of trees that are predominantly jack pine and poplar as opposed to I was looking at a stand that was spruce.

Q. Just so we understand, when the photointerpreter looks at these photographs, are any of the numbers or any of the lines that you have got on there on the photograph when he first starts?

A. No. The photograph -- all the photograph will have at this point in time, it will show, as we indicated before, a sample plot was put in on the photograph, in the case of 102 a sample plot close to the road was put in, that will be identified on the photograph, the back of the photograph will have the description of the 10 stations on that plot.

If we look at the area that is labeled 101, again knowing that the boundary doesn't exist, there is No. 101 on the photograph, there is no sample plot in that location, there is no line between the orange -- the label of 101 and the 102. At the time the photointerpreter is looking, he has got a blank set of photographs, all that is on there is the sample plot and features like the road and the Hydro line.

So geographically the photointerpreter knows where they physically are, but he essentially -- he or she is deciding where to draw this line to distinguish between what is in this area ultimately labeled 102, as opposed to what is in this area ultimately labeled 101. This is a photointerpretation

skill of where does that line between the different stands go.

In some cases the location of the line is obvious, as we talked about when we mentioned it was next to bare ground, and in some cases the location of the line is gray in the sense of a continuum. Forests don't grow in nice, neat distinct blocks of one kind of trees, old/young. This is a relatively natural forest in Ontario, the division into stands is not precise. In fact, if I take my six photointerpreters through this set of photographs they wouldn't all put the line in exactly the same place.

So the photointerpreter is in essence drawing on the photograph the stand boundary and that is marked on the photographs you have got, so the photograph you have is after interpretation. And the photointerpreter will continue across essentially the middle third of the photograph, the part where there is stereoscopic overlap and, again, hence the photograph example that was given to you doesn't show photointerpretation to the sides of the photograph, only jfor the middle core, because that is the area where the stereo overlap best exemplifies what we are looking at.

The photointerpreter will then draw the

stand boundary. In the case of where a sample plot exists, look at the photograph, look at the plot data, and check: Does the plot make sense for the stand. It may or may not. Typically the stand plot does exemplify what in fact the stand shows. It is not a given. If in fact we find the plot is a little bit atypical we will photointerpret this area.

Typically, the stand actually is described by the plot, that usually is the case. What do we do in the area when there is no plot. This is where the photointerpreter's skill is brought in.

So on the stand that is labeled 101 - and we will go through what the labels mean in a moment - the photointerpreter will write on the photograph the description of the species, species composition that the photointerpreter observes on the photo within that boundary. As was mentioned before, in recording the plots we are talking of a description of the species in terms of tenths.

And so in the description in the stand labeled 101 we have a description that reads Pj5, Po3, Sb2. We have already spoken about Pj is jack pine, Po is poplar, Sb is Spruce. This demarcation, this estimate says the photointerpreter sees in that area jack pine, poplar and spruce. The photointerpreter

sees -- five-tenths of what he sees in the photograph in that stand is jack pine, three-tenths is poplar, two-tenths is black spruce.

This is an estimate, this is looking at the trees, the shape, the texture, the crowns, identifying the species, estimating what the proportional breakdown of those three species in this case is.

In 103 -- 102, I beg your pardon, the stand that was black spruce 8, jack pine 1, poplar 1, there was actual plot, perhaps some data representation in the species composition recorded on the plot. plot represented a fairly good species composition. In the case of 101 with the jack pine, there was no plot, it is an estimate.

The jack pine on the photograph is listed first as the working group species. It is also the largest percentage, and we talked before that usually the largest percentage species will determine the working group.

So the photointerpreter is going through unmarked photographs, apart from sample plots, and drawing the stand boundary and putting in part of the description, species composition and some other features on the photograph.

Q. Now, the photointerpreter then does this for the entire area which was inventoried?

A. Correct, for the management unit for this inventory, the photointerpreter will go through the entire area with all the photographs covering that management unit, each photo pair and he will look at stereoscopically the type, the middle third of each of those pairs and, therefore, end up with a complete coverage, because of the overlap, of type photographs for the entire unit.

Q. So when the photointerpreter takes the photographs that he has of the areas which were sampled, I believe you indicated earlier in your evidence that the choice of where to go and sample was affected by a number of factors, one of them being a representative.

A. Yes.

Q. And that would be representative of what?

A. Representative of the range of conditions that one would expect to find in that initial cursory overview of all of the photographs in the area and looking at the previous FRI records.

Q. So if everything was done then, as it is hoped to be done, the photointerpreter then when he

sits down to do this photointerpretation that you are referring to, he would have a photo which had been, indicated an area which had been field sampled and he would have one of those for all of the areas which looked like -- if he had put them all together, he would have a representation of all the different sorts of formations that he would see?

A. The honest answer would be not necessarily.

Q. All right.

A. The representativeness may or may not have been well thought through, well undertaken when the planning was done. We may find that when we actually go and do interpretation there are one or two specialized areas where there was no sample taken.

If you imagine trying to take the representativeness and find estimates for all of them, we will inevitably miss -- we may miss some specialized locales. We may bump into a set of forest stands where the mix of species wasn't exactly identified by a ground plot.

So there is some photointerpretation skills required in looking. There may or may not be an example of every single kind of forest stand subsequently found on that unit for which there was a

ground sample.

Q. Now, I note in paragraph 46 of the witness statement that you in fact describe the information which is reported on forest maps for each stand, and you indicated that the information which is reported on those maps is the estimate of species present within the stand, the proportion of the stand that each species represents, the height and age of the predominant species, the stock, the site class and area of the entire stand.

I believe you described some of those things and you have indicated how they are shown on the stand map. Could you perhaps go back to that map, and let's use stand No. 102, and indicate how the other information in relation to the stand is recorded or conveyed on that map?

A. Before I start that explanation there is some material I think we should distribute regarding the metric values that speak to this particular stand.

In the records that were provided, the records that were provided on pages 187 to 227, which was the photocopy of a book entitled, on page 187, Normal Yield Tables, that particular publication was included because it gives a complete description of normal yield tables and how the data were collected and

also provides some tables that I am going to make reference to.

This particular booklet was produced in Imperial units. It was included because it has a complete documentation of how they were derived. This particular example we are going to explain, this particular forest stand, the units for height are in metric units, and so I would like to have distributed the metric equivalent table so we can follow the explanation of how I end up with the numbers written on the map sheet.

Q. And what we have here is only certain excerpts of the total picture?

A. Yes. I will try and make reference of this metric table relates to this page in the original documentation in Imperial units.

Q. What would you suggest we call this document, Dr. Osborn?

I believe the part of that metric table that we are going to file could be marked as metric tables relating to black spruce--

A. Jack pine.

Q. --jack pine and red pine?

A. And red pine.

THE CHAIRMAN: Exhibit 88.

---EXHIBIT NO. 88: Metric tables relating to black spruce, jack pine and red pine.

MR. FREIDIN: Q. Are these more correctly called metric yield tables, Dr. Osborn?

DR. OSBORN: A. This is an extract from a booklet entitled Normal Yield Tables, Metric. What we have done is -- and this is essentially a metric translation, a metric calculation of the data presented in Document 31, page 187 of the original evidence, and we have extracted parts of this Normal Yield Table, Metric with the metric values to explain this particular example.

Q. All right. So we are going to go and use stand 102 to explain the other information that's provided.

A. So we are going to look at the description that's given on the forest stand map for stand 102, which is the stand that's right at the south bend of the road in the exhibit on page 181.

Q. I understand that in Document No. 21, which was the document Forestry Inventory Procedure for Ontario, there is in fact a legend which the Board may want to refer to at page 159 in the right-hand column which indicates...

THE CHAIRMAN: What document are you on,

Mr. Freidin?

MR. FREIDIN: Document 21 at page 159 of the witness statement. You will see on the right-hand side it says:

"For productive forest areas..."

This is just above the indented part or the table:

"...each stand will have the following information recorded on the map."

And that sort of information in that sort of format is what Dr. Osborn is going to review for stand 102.

DR. OSBORNE: 102, the number itself is the number of that particular stand. We made earlier reference to the organization of the units and the data on a map sheet basis, there was an explanation of townships, an explanation of base maps.

In Ontario, the forest resource inventory uniquely numbers every single forest stand in the province. The unique number is made up of the map sheet number and the forest stand number. So there is a unique address, if you like, for every single forest stand in the province.

102 is the number for that stand in this particular map sheet, and this particular map sheet,

which is Exhibit 85, and that particular map sheet has a reference number, actually, a latitude and a longitude reference number. So the map sheet has a unique number, the stand has a unique number. 102 is the number on that map sheet of this particular stand.

The next line, under 102, in the description says: Sb8, Pj1, Po1 on the document on page 181. This is the species composition, and you read that as saying we had eight-tenths of the stand was spruce, one-tenth jack pipe, one-tenth poplar, and the Sb is underlined inferring it is the working group species.

The next line under description, which reads 48-11-1.2, describes three different paramaters of the stand. First I will describe them and then I will come back and describe how they are derived and/or calculated.

The 48 is the age of the stand, and it is the age, if you may remember, of the working group species, in this case, black spruce. So the 48 is the age and as soon as you see the number not being in multiples of five, you would be very suspecting that there was in fact a real live sample taken in that particular stand. I will explain why a little later.

48 is the age, 11 is the height in metres,

and the 1.2 is the measure of the stocking.

Q. In relation to the height, is that as was the age a measurement of the working group only?

A. It is a measurement based upon the three samples in that plot of the working group species, which was the black spruce. So that line reads age, height, stocking.

And I made reference when we talked about the tally sheet in the ground that we will come back to height and age in terms of deriving something called site class and we will come back to basal area in deriving something called stocking.

So before I explain where the 48-11-1.2 have come from, the fourth line in the description, the number 1 describes the site class. And in Ontario the site classes go from X, the best; to 1 to 2 to 3 to 4, the poorest. So the scale goes from X to 4.

The original scale went from 1 to 4 until we found some trees better than one, so we didn't know what to do with that so we called it X. It goes from X to 4, X being good, 4 being poor in terms of timber, in terms of forest mensuration.

The last value in the description, the fifth line in the description is 35 and that is the area of the stand, given that these data are in metric

units we have 35 hectares.

So the typical forest stand description as given in stand 102: The stand number, species composition working group, age, height, stocking, site class and area.

Coming back on the five lines, the 102 I have talked about is the unique label, the unique number, the unique address. The second line was the species composition, working group identification, coming out of photointerpretation. The third line, age, height, stocking, age and height from the working group species.

Stocking, how do we get stocking? There are two ways in which stocking in the FRI is determined, two ways in which it is derived.

The first would be appropriate for stand 102 because stand 102 had some actual ground measurements taken in it and when we walked through and showed you how to use the prism and how to calculate for the number of trees and the basal area, the tally sheet recorded the actual basal area found in that stand, actual.

Stocking is a comparative term which means actual and some pre-established managerial norm. So stocking is a ratio. What have I actually got in

comparison with what managerially is appropriate or desirable or normal?

1.2 being better than 1, which would be the norm, so I have got stocking higher than I would normally expect in this particular example.

Now, how do I get that from this particular stand? How do I find the norm with which to compare the actual sample value of basal area that I measured on the tally sheet? Where do I get that from?

In the first line we mentioned site class and site class in Ontario is derived from a relationship between height and age. I said, site class X is better than 1, is better than 2, is better than 3 which means at any given age, the very tall trees will exemplify site class X, and the shorter trees will grow on a site that is labeled site class 3 or labeled site class 4.

Q. If there are the same age?

A. If they are the same age. Thank you.

In this particular example, in 102, the age is estimated at 48 and the height was estimated at 11 metres. In the document you just received with the metric units, the first page of that document--

Q. That is Exhibit 88.

A. --the first page of Exhibit 88 is a

graph with height on the left-hand vertical axis in metres and age on the X axis on the bottom in years.

For black spruce -- and each of these graphs has to be labeled as to what working group species are we talking about because the height and age relationship and site class relationship varies by species, so we need to know the working group to know which table to look at.

Q. Just before you describe that, I notice on this document on the right-hand side it gives site class and rather than an X it has got 1A.

Is 1A supposed to be the same thing as X or...

A. Yes, sir. Our particular example in stand 102 was 48 years old and 11 metres tall. So if you look on the age scale, the horizontal scale to age 48, and if you go up vertically until you reach the horizontal line of 11 metres, you will end up with an intersection that is in a white zone and very close to the black line that goes up to the right-hand side of the page labeled No. 1, all right.

So we have gone from 48 on the age axis up the page until we bump into the line that reads 11 metres in height. That intersection falls into a white zone on this particular overhead, this particular hard

copy which, if you follow the zone out to the right-hand side, we will find to be 1.

So what I am doing in this particular example, stand 102, I am 48 years old and I am 11 metres tall. So I am here. (indicating)

Now, these curves which show height development over age are based on a series of plots that were measured back in the 50s in Ontario to produce an average set of dimensions of how does the height over age vary in Ontario, and a whole series of plots were measured. So these basic relationships of height over age by species were derived.

Q. Dr. Osborn, am I correct that the plots on which those measurements were made were in natural forests?

A. Correct.

Q. And by natural forests, what do you mean by that?

A. Forests that supposedly mankind haven't interfered with, that have been provided by nature. The reason for my hesitancy, in all honesty, mankind has been burning in the forest in Ontario, deliberately or otherwise, for a long period of time.

From the white person's point of view they are "natural stands", in the sense that they were

not planted, seeded artificially, they are natural in the sense of they come about from natural causes rather than artificial regeneration.

Q. Thank you.

A. This series of data, this series of plots gave rise to a variety of species, in this case for black spruce, of height/age relationships and there is a distinction that said: I can find in Ontario very tall trees of a certain age and very short trees, let's break that spread into some completely arbitrary chosen classes.

In Ontario we decided we will have site class 1, site class 2, site class 3, lower than 3 is 4, better than 1 subsequently happens to be 1A or X. We could have taken it to 6 or 7 - where I worked in Australia there were 7 - a set of site classes.

Our example was 11 metres tall and 48 years old. It falls in the band that is exemplified by trees classified as site class 1. It is a label that says trees at 48 years old and 11 metres tall are typically higher than trees down in the green band at site class 2.

We derived how we got to the site class 1 value that is recorded on stand 102. Why did I go through that if I am trying to talk about stocking? I

need to know the site class because my stocking is a comparison between what I have actually got, in this case in the basal area, versus my expected norm.

On page 3, of Exhibit 88, third page, and page 3 of Exhibit 88 is equivalent to, it is the metric equivalent of the data on page 206 in the evidence. They are both entitled black spruce, site class 1.

On page 3 of Exhibit 88, site class 1, black spruce, there are a series of headings in this table. This table, like that height/age curve, is a summary and a synthesis of the data from the plots earlier alluded to that were measured in the 50s to describe how "natural stands" grow in Ontario and give rise to data that are collectively called a yield table, forest mensurational crop, if you like, and a yield table, it is done by species, it is done by site class. A typical form and format of a yield table is shown as in this table, it will show for a variety of ages what sort of other forest mensurational values you will get like basal area, volume, height.

So a yield table is rather a specialized forester's tool for something other professions have that are biologically dealing, doctors will have a graph of children's progression in age and average weight, a similar sort of relationship. Here we are

dealing with trees, their age and, in this case, their basal area or their body or their height.

In that page 3 of Exhibit 88 there are a series of column headings, the first being the age in years, going from age 20, in this case in spruce, to age 150. There then is a column entitled height and sub-column average in metres and a range in metres.

Then there is a column labeled DBH in centimetres, shorthand for diameter at breast height. When we were measuring the pillars in the room, I alluded to where you sighted with the prisms. Foresters typically measure diameter at DBH, which here in Ontario is 1.3 metres above the ground.

The next column is entitled number of trees, and the fifth major column is entitled basal area in metres squared. So the fifth column we have in the table -- in our normal table, a norm to which we want to compare the actual values and estimate the different ages, in this case for black spruce site class 1, what the basal area is expected to be.

Q. So the norm or the managerial norm that you referred to for stocking is, in fact, the basal area that you find in the appropriate site -- pardon me, appropriate yield table?

A. Yes.

Q. If you are dealing with something that wasn't black spruce and you are dealing with jack pine and you wanted to know the stocking, you would have to go determine the site class of that particular stand and go to the appropriate yield table for that particular site class and find out what the basal area was in the yield tables?

A. Correct. So new yield tables are put together by species by site class.

MR. FREIDIN: Mr. Chairman, I am just looking at my watch and I am just wondering, if we are going to break at two o'clock this might be an appropriate place to stop and pick up from here tomorrow.

THE CHAIRMAN: Very well.

Ladies and gentlemen, we will now adjourn for the day and we will recommence tomorrow morning at 11:30, and we will probably end up taking our luncheon break tomorrow at about 1:00.

Thank you.

---Whereupon the hearing adjourned at 2:00 p.m., to reconvene Wednesday, June 29th, 1988, commencing at 11:30 a.m.